SHORT WAVE THERAPY and GENERAL ELECTRO-THERAPY

SHORT WAVE THERAPY
and
GENERAL ELECTRO-THERAPY

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SHORT WAVE THERAPY AND GENERAL ELECTRO-THERAPY ILLUSTRATED

SHORT WAVE THERAPY
and
GENERAL ELECTRO-THERAPY
Illustrated

by

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INTRODUCTION

THE PRESENT VOLUME *does not pretend to be a textbook on physical therapy nor to replace one. Physical therapy methods have spread with such rapidity during the last 15 years that there are very few physicians today practising general medicine who do not have one or the other appliance of physical medicine. This sudden growth has led to an anomalous situation. On the one hand physical therapy with few exceptions is not yet taught in medical schools, and on the other hand, only few men in general practice are in a position to begin an extensive technical study of a perfectly new subject. The busy practitioner cannot devote much time to theoretical or technical details. He wants what he wants when he wants it and wants it handy.*

Manufacturers have tried to meet this situation by furnishing their prospective customers or users of their products pamphlets in which sales talk is intermingled with suggestions as to therapy. But it is obvious that a man who wants to sell an apparatus will be inclined to over-estimate the scope of its applicability. In most instances this is not due to any intention of misleading his client but to reports in medical literature which reflect more the enthusiasm than the critical acumen of the author. Even the most ardent advocates of physical therapy stand often aghast at the extravagant claims made for some methods of treatment. The individual paper may not do much harm, as not many people read the article in question, but when

such claims are embodied in commercial literature, without due criticism and details, as the opinions of medical men and specialists, they reach a large number of people and may cause considerable damage.

For this reason we must heartily approve the policy of the American Medical Association not to allow manufacturers to make suggestions in their literature as to the indications of treatment in various pathological conditions. On the other hand, there is a definite need for a concise book on technic to reduce the dangers which lie in the incorrect use of methods of physical therapy by physicians who want to employ them but who feel that they cannot devote much time to their study.

The present volume proposes to fill this need by elucidating electro-therapy methods with the aid of pictures. It illustrates the technic wherever there is any doubt as to the manipulation of the various apparatus, the application in the individual case, and the strength and duration of treatment used.

It has been said in the introductory sentence that this volume does not pretend to be a textbook of physical therapy. Anyone who has learned a correct method and technic and obtains results will one day feel inclined to go deeper into the study of this interesting branch of therapy and will consult one of the modern textbooks on physical therapy.

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DIATHERMY

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DIATHERMY is a term applied to an electrical process which creates heat in the body tissue. Theoretically every electrical current does this but in the low frequency currents, the galvanic and faradic currents, the chemical and stimulating action is so strong that the intensities which can be used are small and the increase of temperature can be completely disregarded.

The diathermy current is a high frequency current of about one-half to two million alternations per second and as such does not have any chemical action. It does not stimulate nerves as low frequency currents do. In passing through the tissues it creates heat just as the street current heats a filament in a lamp. The diathermy current creates more heat in tissues with high resistance (fat) than in other tissues (muscles). The current chooses the path of least resistance.

A few suggestions may be in order for selecting a diathermy apparatus. The operation of the apparatus should be simple. The regulation of the amount of current should preferably be effected by turning a single control knob so that the patient can adjust the strength of the current himself, if the physician so desires. A cut-off within reach of the patient should be provided either in the apparatus itself or in the line leading to it. Thus a safety device is placed in the hands of the patient which enables him to avoid burns. Even if the attendant is present the patient can cut off the current more quickly than he can have the attendant do it.

The wires which lead from the apparatus to the electrodes should be attached to them by clips which hold tight, because if they slip and come in contact with the bare skin they cause burns. A multitude of electrode types has been suggested to facilitate the use of diathermy, but with few exceptions they are impractical.

A great many physicians use metal plates, moistened with soap or conductive jelly and tied on with bandages, or tin foil, pressed on the skin in various ways, usually with rubber sponges or bandages.

The best way is to use pads of either absorbent cotton or small towels soaked in 15% salt solution between the electrodes and the skin. They bring about the best contact. As clean pads are used in each case sterilization of the electrodes is unnecessary. The objection has been raised that these pads heat up too much but if a strong salt solution is used the

heating of the pads is equal to the heating of the tissue and the skin sensation becomes a safeguard for the temperature rise in the deeper tissue. If the body surface is uneven the padding readily conforms to it while metal does not always make proper contact. Hairy skin need not be shaved but must be soaked thoroughly.

Allan Hemmingway in an article, "Temperature Distribution in Local Diathermy Treatment," *Radiology,* Vol. XVIII, 1931, December, page 1258, states:

"In all experiments on dogs and human subjects no superficial burns occurred with pad electrodes. Using high current values on dogs, contact burns took place beneath the metallic electrode. No burning was ever observed with saline pad electrodes."

Much higher intensity can be used with padded electrodes and all statements in this book in regard to intensity relate to ***padded electrodes.*** For metallic electrodes the intensity has to be reduced.

The plates are tied to the body with elastic cotton bandages, so that the plate clamps are separated from the skin by a layer of the bandage. This has the advantage that the patient cannot be burned if the clamp or wire should become loose. When small parts of the body, such as the elbow, are being treated, care must be taken that the padding does not protrude so far as to touch the other electrode and thus produce a short circuit. In the treatment of the back, the patient lies on one plate, while the other is weighted down by a sandbag.

One must be sure to add salt to the water used in the pad. Being a bad conductor, plain water offers a higher resistance to the current than the body. The pad becomes hot and the patient is burned as he would be when using too hot a water bag.

While receiving treatment, the patient should have no other sensation than that of a pleasant heat equally distributed over the whole area treated. A faradic sensation may be caused by a loose connection or a broken wire. A stinging sensation is usually caused by an unequal distribution of the current or an uneven surface of the electrode. This can be corrected by placing a piece of cotton dipped in a salt solution between that part of the electrode and the body. If the patient complains that the heat is too intense, while the ammeter does not show a strong current, it may be because salt has been forgotten altogether or added in too small a quantity.

The skin of some people, particularly of women, is so tender that even with the greatest care slight burns cannot be avoided. For this reason the patient must always decide whether or not the heat is too great. The patient's statement should never be disputed, no matter what the meter shows. Unless the patient can control the strength of the current he should never be left without supervision. If control of the current strength by the patient is impossible, some arrangement should be made to enable him to cut off the current if necessary. An unconscious pneumonia patient must be watched with the greatest care, and the closest attention must be paid to the minutest detail of the technic so that no metal can touch him. A weak current is better than a burn.

How to place the electrodes and what sizes to use is indicated under each illustration.

To treat a superficial process it is advisable to use a small electrode slightly larger than the area of the pathological process and a large electrode on the opposite side of the body. Such large electrodes are called indifferent electrodes as the density of the current passing through them is too low to produce any local effect. For a deep-seated process and if, for anatomical reasons (for instance on the chest) the plates are quite distant from one another, two large electrodes must be used for an effective treatment. The size of the electrodes, therefore, must be governed by the location and extent of the pathological process.

Starting the Current. The current must be started only after the electrodes are fastened securely to the body. The current should be increased slowly so that any error in the application of the electrodes can be detected and corrected before any damage is done. The current can be cut off quickly without any harm. *Current must be turned off before removing the electrodes.*

Dosage. The amount of current depends upon the size of the electrodes, whether they are padded or not, on the pathological condition to be treated and on the disposition of the individual patient.

The larger the electrode the more current must be used, for the effect depends upon the density of the current. The density is invariably proportionate to the size of the electrode. It must be said, however, that experience has shown that we cannot use twice as much current with a double size electrode, but somewhat less than that.

The therapeutic effect of diathermy is not necessarily greater the higher the temperature obtained; this is true only when we intend to kill micro-organisms which are sensitive to heat, like gonococci and pneu-

mococci. In most other instances we get a better effect by the application of moderate heat and in some cases where the pathological condition is due to other micro-organisms, high temperature is distinctly harmful as it activates the infectious process.

Location of Electrodes. If the treatment is to be of value, the electrodes must be so placed that the current will pass through the seat of the pathological process. For this reason it is necessary to determine this accurately, regardless of where the pain may be.

Duration of Single Treatment. The duration of the treatment depends on the pathological condition with which we are dealing. In order to damage or destroy micro-organisms which are not heat resistant we must prolong the treatment up to an hour or more. It is obvious that the prolongation of the treatment, within reasonable limits, is logical if the heat itself is the curative factor. If, on the other hand, we are dealing with a condition caused by organisms which are heat resistant there is danger of exacerbation and therefore only short treatments (15-20 minutes) at low intensity should be used in the beginning. The reaction of the patient must be our guide. In general, a treatment of thirty minutes' duration promises the best results. Treatments of ten minutes' duration, as they are given by some physicians who use a number of modalities on the same patient in one session are valueless.

Frequency of Treatment. The nature of the case and the effect we expect from the treatment are the guiding factors. The immediate effect plays a dominant role. The better the result the sooner the treatment is repeated. If the progress is slow it is advisable to reduce the frequency so as not to tire the patient.

DIATHERMY DONT'S

Don't treat acute and subacute inflammatory processes with diathermy, as it increases the inflammation.

Don't treat closed abscesses, or poorly drained sinuses. Diathermy increases the production of pus and thus the pressure in the cavity.

Don't treat closed exsudates of any kind with diathermy, as the exsudates increase by the hyperemia produced.

Don't continue to treat so-called rheumatic conditions with diathermy if exacerbations occur. This indicates an active focus.

Don't open the apparatus and reach into it while the current is on. Severe injuries may result to you from it by touching high tension, low frequency parts.

Don't treat a patient with diathermy in places showing anesthesia, as he does not feel the heat and is easily burned.

Don't turn the current on full strength at once. The electrodes may be badly applied, wires loose or apparatus out of order.

Don't leave the patient unguarded unless he can cut off the current readily.

Don't tell the patient who complains of too much heat that the meter does not show it.

Don't argue with the patient about his sensations. *He is always right.*

Don't take off the bandages before shutting off the current.

SHORT WAVE THERAPY

●

IN SHORT WAVE machines, whether operated by spark gaps or tubes, just as in diathermy apparatus, it is the inductance and capacity which determine the frequency of oscillations. They are so chosen as to obtain oscillations of ten million or more per second.

The product of frequency and wave length is always equal to the speed of light or electricity, that is 300,000,000 m/sec, so that a frequency of 30,000,000 denotes a current of 10m wave length, a frequency of 20,000,000 a current of 15m wave length, etc. In describing high frequency currents the wave length is usually given instead of the frequency because this implies the use of smaller figures.

The term capacity must not be confused with output. In a high frequency circuit capacity denotes the amount of electric charge which the condenser in that circuit is able to take on. Through a condenser of small capacity which is charged and discharged more frequently, just as much energy can be transmitted as through a larger condenser which is charged and discharged at a lesser rate, the difference lies only in the distribution of the lines of force in the body.

While in a diathermy circuit the condenser which determines the capacity is formed by metal plates separated by a non-conductor such as glass or mica, called the dielectric substance, in a short wave circuit that condenser is made up of the two treatment electrodes and the tissues which separate them.

The dielectric substance in any condenser field except air is heated, due to absorption of part of the electric energy swinging in it. When the body forms the dielectric substance, the body tissues are therefore heated. If our tissues were pure non-conductors they would be heated merely through these "dielectric losses." But as they are partly conductive they are also heated through resistance losses, just as in diathermy.

For therapeutic purposes the short wave form of heating has an advantage, because the dielectric and electro-magnetic energy absorption of most human tissues, with the exception of fat and bone, is fairly even while the resistance of different tissues varies greatly in long wave treat-

ments, resulting, for instance, in much greater heating of fatty tissues than skin or muscle tissue. The more even penetration with electric energy which can be accomplished in the electric field between two condenser plates enables the heating of deep-seated tissues which cannot be reached by diathermy currents when no paths of good conductivity are available.

It has been said before that the frequency of oscillation depends on the capacity. Capacity in turn depends on the size of the electrodes and the dielectric medium. That any particular wave length offers the greatest therapeutic effect has not been shown and from clinical reports it seems that any wave length between 3 and 25 meters will give about the same result, provided it is given with proper wattage and correct technic. There is still a good deal of discussion regarding the importance of the wave length, a division being made between ultra short waves of from 3 to 10 meters and short waves of from about 10 to 30 meters. *But in the following the term short waves refers to both, unless the term ultra short waves is specified.*

It is not the object of this book to enter into a discussion of technical problems, specificity of wave length, etc., particularly as the entire field is still in evolution. A few words, however, must be said about the physiological action of short waves.

The physiological effect of short waves and ultra short waves differs from that of diathermy and radiant heat in that with the former the capillaries are dilated strongly and persistently, more than the arterioles and large veins. Thus, the circulation in an inflamed area is improved and the defensive mechanism, especially phagocytosis, is increased. The inflammatory process is flushed with alkaline blood and thus the high acidity which characterizes inflamed tissues and causes the pain is neutralized. This explains the rapid diminution of pain which is an outstanding feature of the effect of short waves in acute inflammatory conditions.

It has been maintained that short waves inhibit the growth of and destroy bacteria. Some authors report positive, others negative results in this respect. The bactericidal effect is attributed to the heating of the micro-organisms only (Punktwærme), while the surrounding tissue remains cool because it is flushed by the blood circulation or absorbs less energy due to its different dielectric absorption property. This hypothesis has been disproved by recent experiments of Kulka and the results obtained by short wave treatments in infections must therefore be ascribed to indirect effects of the improved circulation.

Even if the results on bacteria were uniform *in vitro,* they do not seem applicable to pathological processes, because the energies generally applied and reported as effective are far too low to have a bactericidal effect. In fact, it is frequently stated that low energies have a better effect than high ones. Jorns, for instance, shows that high energies decrease the phagocytic index and may have a bad therapeutic effect. Stiebock maintains that he obtained the best results with applications of 1½ to 5 minutes. Liebesny warns emphatically against heating up the tissue considerably and my own experience corroborates these statements. These clinical observations cannot be stressed sufficiently as they constitute the strongest arguments against the hypothesis that short waves are effective in infectious conditions because of their bactericidal action. This assumption is weakened further by the observation that high energies applied in the form of short waves for 20-30 minutes may do actual harm by reducing the vitality of the tissues and the blood cells. The bad effects of short waves reported in the literature can be traced to too intensive treatments.

Jorns' experiments have failed to demonstrate any influence on the healing of wounds or on callus formation in animals and this may influence indications. For the present I consider it advisable to base one's indications on such action of short waves as is demonstrated by the improvement of the circulation, particularly in areas which heretofore were inaccessible to local heat applications; for instance, inside the skull.

Application of Electrodes and Dosage.

Short wave electrodes are **condenser electrodes,** that is, metal plates enclosed in insulating substances or separated from the body by an air space. The correct way to apply them in various pathological conditions will be shown in the illustrations given in this book.

To avoid distortion of the field, there should be sufficient space between the body and the electrodes. If the spacing is provided by rubber or other material we must take into account that these materials are liable to heat up considerably due to absorption of the energy of the machine. It is advisable to place a towel between skin and electrode for the purpose of absorbing perspiration and avoiding burns. The ideal spacing is provided by air. The width of air space depends on the wave length. The shorter the wave the wider the air space can be.

The electrodes need not be located directly opposite to one another but may be applied as cuffs (Fig. 40) or lying on the same plane (Fig. 26). The lines of force pass then through the entire part which lies in the field. This latter technic is ineffective in the treatment with diathermy as the current does not penetrate further than the skin.

Attention should be drawn to the fact that the heat effect on the skin increases with the decrease of the space between skin and electrodes. If a superficial effect is desired the air spacing should be decreased. It is however not correct to judge the intensity of the treatment or the strength of the apparatus according to the heat effect on the skin. A weak apparatus with small spacing will cause more heat on the skin than a strong apparatus with large spacing.

Instead of the electrodes described an **induction coil electrode** can be used in combination with some machines. These coils will give the best heating effect if wound closely around the part to be treated. The windings should not be spaced too far apart from one another. When treating the leg or arm from 3 to 7 turns are used depending on the machine. The free ends of the coil should not exceed 2 to 3 feet because the greater amount of coil used, the greater the heat. It will be found that in certain applications the heating effect of the coil equals that of condenser electrodes while the application is sometimes simpler. It may be found advisable to hold the coil to the skin with elastic bandages because the heating effect decreases rapidly with distance. When treating the pelvic area, the thoracic region or the posterior chest the coil is preferably wound into a flat spiral (pancake) and pressed against the chest by means of an elastic bandage. The electric field created can be detected even on the opposite side of the body.

Though the treatments can be given through clothes, such technic is *not* advisable. Under the influence of the heat the patient perspires locally and generally and this may lead to unpleasant complications (colds) and burns.

As the heating effect on the skin is not as strong as in diathermy applications, we have no reliable guide as to what intensities may be used without harm. For this reason it is necessary to proceed cautiously.

The length of the treatment depends on various factors. The greater the volume of tissue under the influence of the electric field, the longer the treatment may be extended. More important still is the condition which we are called upon to treat. Acute inflammatory conditions will respond better when treated not more than 10 minutes, as the biological effects mentioned on page 11 show their maximum action in that period. If treated longer the increase of the local temperature becomes marked and this increased temperature may stimulate and aggravate the inflammatory process.

The question arises in which cases short waves are indicated and in which diathermy should be used. The outstanding difference in indication which I have noticed in my work consists in the action on inflammatory processes. While every textbook and many articles underline the presence of an acute or subacute inflammatory process as contraindication to diathermy, we can use short waves even in acute inflammatory conditions with great success for the reasons given above. It may not be out of order to state here that chronic, particularly non-infectious, processes are only infrequently mentioned in the literature as indications for short waves.

Many salesmen try to convince the inexperienced physician that diathermy is out of date and that short wave therapy is replacing it. This is not the case. I have for instance treated a case of cervical radiculitis twice with short waves without the slightest results but was able to stop the pain by one diathermy treatment. In another patient who complained of pain in the lumbar spine and sacro-iliac region which had lasted for months we had no result whatsoever with short waves but the improvement started *immediately* when we switched to diathermy. The same result was observed in a case of ischias. I repeat that I have in mind an improvement immediately after the conclusion of each treatment.

But there are also technical reasons for the preference of diathermy apparatus in some cases. Whenever we have to treat body parts of considerable extension, for instance the arms or legs in longitudinal direction so that the electrodes have to be placed far apart, most of the heat effect produced is due to ohmic losses and only a small part to dielectric losses. Under these conditions the efficiency of a short wave machine is far below that of the diathermy machine. A short wave apparatus designed for local application is not suitable for the production of general hyperpyrexy, pelvic heating in gonorrhea, and autocondensation. Tube machines will not activate vacuum electrodes or permit monopolar dessication.

Short wave therapy is a very valuable addition to the physical therapy armamentarium as it enables us to treat conditions which formerly were inaccessible to electrotherapy. It does not, however, replace diathermy because diathermy was always contraindicated in precisely those cases in which short waves are found particularly valuable.

The duration of each treatment is determined so far on an empirical basis only. It is therefore impossible to give in the following illustrations detailed and definite instructions which would be indicated in the individual case. I personally never apply short wave treatments for more than 20 minutes but often much less. It should be repeated that some reports

in the literature mention the fact that mild short treatments are more effecive than strong ones.

In the following pages the technic of applying short waves to different parts of the body is illustrated. Small electrodes are either tied to the part which is to be treated or held by special appliances at the desired distance.

While the intensity of the diathermy current can be prescribed according to the size of the electrodes, it is not possible to do so with the same accuracy for the short wave applications because in the latter the skin sensation must be held at a much lower value, much more energy being absorbed by the vascular tissue in the field than by the skin. It is advisable, therefore, that the physician should try each apparatus and each pair of electrodes on himself, watch his own sensations and note the amperage showing on the meter when different elctrodes are used and different volumes of tissue are in the electric field. The amperemeter serves more for proper tuning but gives only a relative indication of the intensity of the treatment.

Following is a list of the most important indications as reported in the literature together with the name of the author or authors. Where no names are given as reference, favorable reports are general. These indications do not, of course, cover all the conditions in which short waves may be useful. It should be remembered, however, that the enthusiasm which accompanies every new method often leads to claims which may not stand the test of time. Remissions which occur in the course of many diseases (lancinating pains, psoriasis, etc.) may be misinterpreted. The author gives the reports without any further comment.

Acne, *Schliephake*
Actinomycosis, *Liebesny, Weissenberg*
Adhesions (peritoneal), *Laquer, Schweitzer*
Angina pectoris, *Schliephake, Weissenberg, Saidman and Cahen*
Appendicitis chronica, *Schliephake*
Arthritis (monarticular), *Schliephake, Laquer, Vaernet, Wolf*
Asthma bronchiale, *Laquer, Schliephake, Wolf*
Bronchiectasy, *Schliephake, Laquer, Liebesny, Weissenberg*
Bursitis subacromoidalis acuta, *Wolf*
Carbuncles
Cholecystitis, *Schliephake, Laquer, Schweitzer, Dausset*
Colds, *Weissenberg, Schliephake*
Eczema, *Schliephake, Weissenberg, Vaernet*
Edema of hands, *Wolf*
Empyema, *Schliephake, Laquer, Liebesny*

Endocarditis, *Schliephake*
Epididymitis (non-specific), *Schliephake, Wolf*
Erysipelas, *Pflomm, Schliephake, Raab, Weissenberg*
Facial palsy, *Schliephake, Weissenberg*
Fistula after nephrectomy, *Liebesny*
Forunculosis
Frost bites, *Burckmann, Weissenberg*
Glomerulonephritis, *Raab*
Hemorrhoids and fissure, *Weissenberg*
Hemiplegia, *Schliephake, Dausset, Laszlo, Weissenberg*
Hepatitis, *Schliephake, Liebesny*
Herpes Zoster, *Saidman, Weissenberg*
Hidradenitis
Hordeoli, *Wolf*
Hypopituitarism, *Weissenberg, Wolf*
Intermittent claudication and foot gangrene, *Liebesny, Last*
Lung abscess, *Schliephake, Liebesny, Laquer*
Malta fever, *Izar and Moretti*
Mastitis, *Laquer, Liebesny, Vaernet*
Migraine, *Schliephake, Liebesny, Dausset, Rechou*
Myocarditis, *Schliephake*
Neuritis and neuralgia,
Sciatica, *Schliephake, Vaernet, Liebesny*
Trigeminal, *Schliephake, Weissenberg, Jouard*
Osteomyelitis (acute), *Schliephake, Liebesny, Laquer*
(chronic), *Schliephake, Liebesny, Vaernet*
Otitis media acuta, *Vaernet*
Paronychia, *Schiephake, Laquer, Weissenberg*
Perianal abcess, *Vaernet*
Peritonsilar abcess, *Vaernet*
Pleuritis sicca, *Schliephake, Weissenberg*
Pneumonia (unresolved), *Schliephake, Laquer, Wolf*
Pyelitis-Cystitis, *Raab, Weissenberg*
Pylorospasm, *Weissenberg*
Psoriasis, *Pflomm, Vaernet*
Raynaud's disease, *Last, Rechou, Laquer*
Sinusitis
Struma parenchymatosum, *Weissenberg*
Tabes dorsalis (lancinating pain), *Schliephake, Weissenberg*
Tendovaginitis crepitans, *Vaernet*
Tonsillitis, *Schliephake, Weissenberg*
Tuberculosis (lungs), *Liebesny, Schliephake*
(joints), *Liebesny* (denied by *Pitzen*)
Ulcus cruris, *Schliephake, Saidman and Cahen*
Ulcus cruris with phlebitis, *Vaernet*

It is necessary to warn against the dangers of short waves of high intensity. Diathermy may produce burns in the skin or less frequently in the subcutaneous tissue. Short waves can produce serious destruction of deep tissues.

SHORT WAVE DONT'S

No metal parts should be near the treatment field (hairpins, etc.).

No metal, oilcloth, leather or moist fabrics should be on the treatment table.

No cable must touch the patient, or another cable; use felt or dry towels.

Do not use ordinary metal (diathermy) electrodes, except with special condensers in the patient's circuit.

Do not treat the patient through clothes.

Do not allow moisture to accumulate between electrode and skin. Keep it dry.

Do not forget proper spacing.

Do not treat patients with anesthetic parts or unconscious patients without steady supervision and keep large airspace, two inches, between body and electrode in such case. Use small intensities.

Do not be misguided by the meter. It indicates the correct tuning but not the dosage applied.

Do not disregard patient's complaint of too much heat.

Do not treat subacute or acute inflammatory conditions longer than 15 minutes nor with high intensity. Only a comfortable warmth should be felt.

Do not treat protruding parts of the body (ears, nose) without considerable spacing between skin and electrodes to avoid destructive burns. Ears must be tied to head, tip of nose has to be avoided (see fig. 5).

DIATHERMY THROUGH MANDIBULAR JOINT

●

Indications: Arthritis, injuries to the joint.

Intensity: 600-700 M. A.

Duration: 30 minutes.

Size of electrodes: 1½ x 2 inches on each side.

Motions of the jaw during treatment.

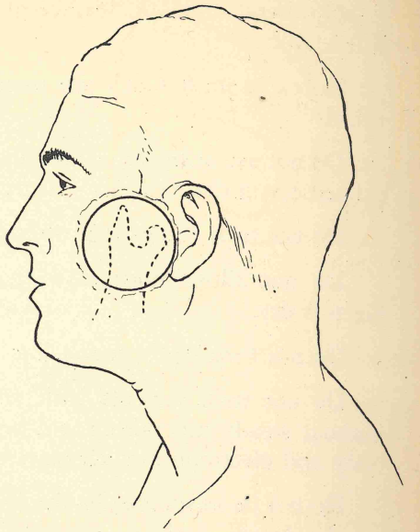


Fig. 1

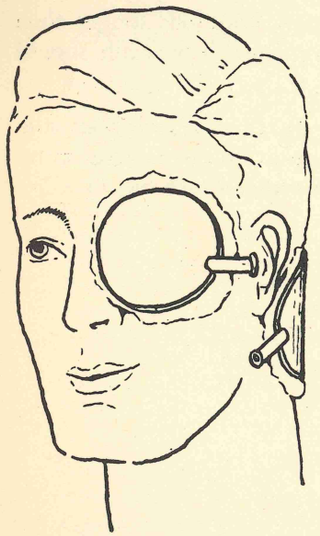


Fig. 2

DIATHERMY THROUGH ONE EYE

●

Indications: Pathological conditions of one eye, trifacial neuralgia, upper branch.

Intensity: 500-600 M. A.

Duration: 30 minutes.

Padded with cotton soaked in 15% salt solution.

Electrode on eye: 2½ x 2½ inches; electrode on nape of neck: 2 x 6 inches.

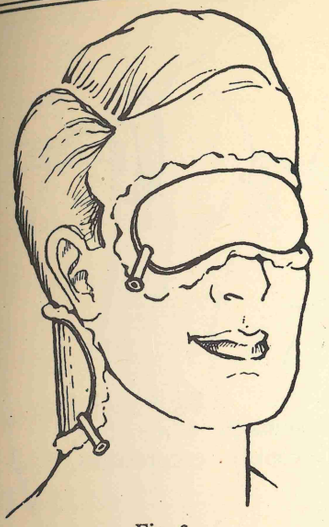


Fig. 3

DIATHERMY THROUGH BOTH EYES

●

Indications: Retrobulbar neuritis, trifacial neuralgia, pathological conditions of both eyes.

Intensity: 800-1000 M. A.

Duration: 30 minutes.

Size of electrodes: Active electrode 2 x 4 inches; indifferent electrode on nape of neck: 2 x 6 inches.

Technic for diathermy: Place a small flat piece of cotton soaked in 15% salt solution on each eye, then another larger pad covering both eyes under metal electrode.

SHORT WAVE THROUGH MAXILLAR AND FRONTAL SINUSES, LATERAL DIRECTION

●

Specially constructed hard rubber electrodes securing air space may be used to advantage.

Indications: Acute and subacute empyema of antrum. Drainage advisable. Acute and subacute sinusitis and polysinusitis, threatening atrophy of optic nerve (glaucoma).

Intensity: gentle heat.

Duration: 10 to 15 minutes.

Note: Tie ears close to head.

Fig. 4

SHORT WAVE THROUGH THE FRONTAL REGION ANTERIO-POSTERIOR DIRECTION

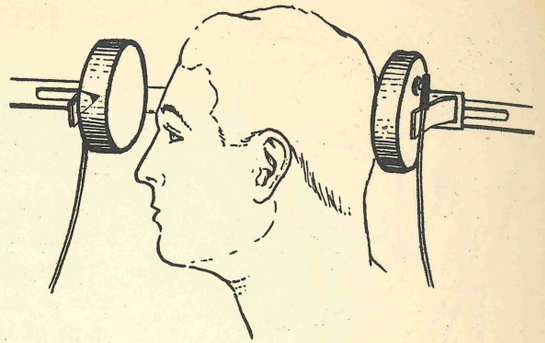


Fig. 5

Indications: Acute and subacute frontal sinusitis, ethmoiditis, hordeoli, threatening optical atrophy (glaucoma), encephalitis, trifacial neuralgia, hemiplegia.

Intensity: gentle heat.

Duration: 10 to 15 minutes for inflammatory processes; 20 to 25 for optical atrophy.

Care must be taken not to place the electrode in front of the tip of nose to prevent burns.

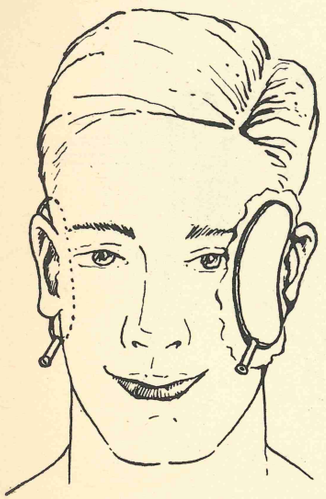


Fig. 6

DIATHERMY THROUGH HEAD IN LATERAL, OBLIQUE DIRECTION

Indications: Bell's palsy, trifacial neuralgia, tinnitis, chronic otitis media.

Intensity: 800-1000 M. A.

Duration: 30 minutes.

One electrode must be placed behind the ear on the affected side, the other in front of the ear of the other side.

For electrode behind the ear see Fig. 8.

For electrode in front of ear see Fig. 7.

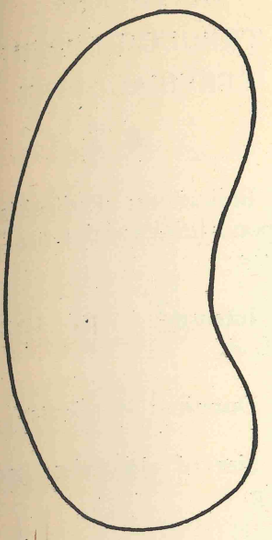


Fig. 7

FORM OF ELECTRODE IN FRONT OF EAR

Size of electrode: 2 x 4 inches.

FORM OF ELECTRODE BEHIND THE EAR

(Also for diathermy through cervical spine)

Size of electrode: depending on length of neck. For long neck, 5 x 2 inches; for short neck 3½ x 2 inches.

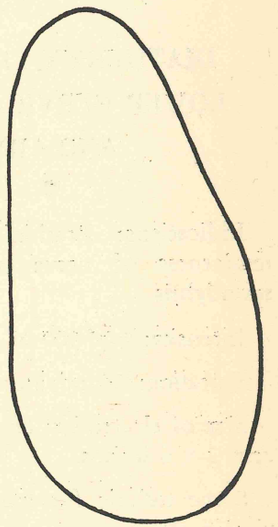


Fig. 8

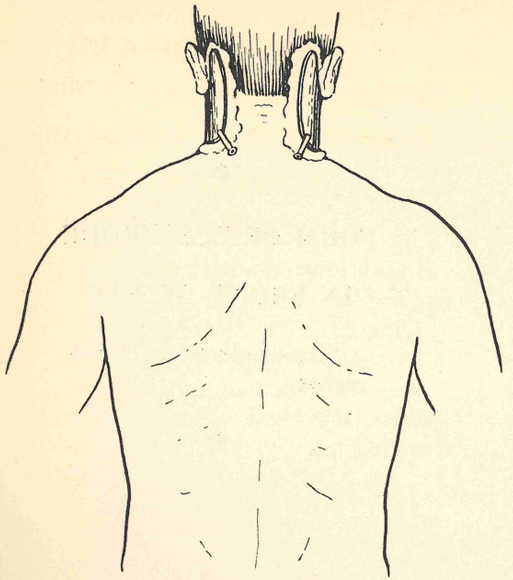


Fig. 9

DIATHERMY THROUGH UPPER CERVICAL SPINE

●

Indications: Radicultis, spondylitis, nodular headache

Intensity: 700 - 1200 M. A.

Duration: 30 minutes.

Size of electrodes: see Fig. 8.

DIATHERMY THROUGH LOWER CERVICAL SPINE AND ARM

●

Indications: Brachial neuritis with tenderness of nerve trunks, cervical spondylitis.

Intensity: 800-900 M. A.

Duration: 30 minutes.

Size of electrodes: on neck 3 x 6; on arm 2 x 6 inches.

Same technic for ionization of cervical roots.

Fig. 10

Fig. 11

DIATHERMY THROUGH LOWER CERVICAL AND UPPER DORSAL SPINE (ANTERIOR-POSTERIOR)

●

Indications: Brachial neuritis including fingers, spondylitis.

Intensity: 1200-1500 M. A.

Duration: 30 minutes.

Size of electrode: Active 3 x 5 inches, indifferent electrode on chest, 6 x 8 inches.

DIATHERMY THROUGH VERTEBRAE

●

Indications: Herpes zoster, (at the affected roots), neuritis cruralis (lower dorsal spine), affection of the roots of the sciatic nerve (lower dorsal and upper lumbar vertebrae), spondylitis.

Intensity: 1500-3000 M. A. (depending on size of electrodes).

Duration: 30 minutes.

Active electrode on all the affected vertebrae, large indifferent in the front, patient may lie on back or stomach. Electrodes secured by sand bags.

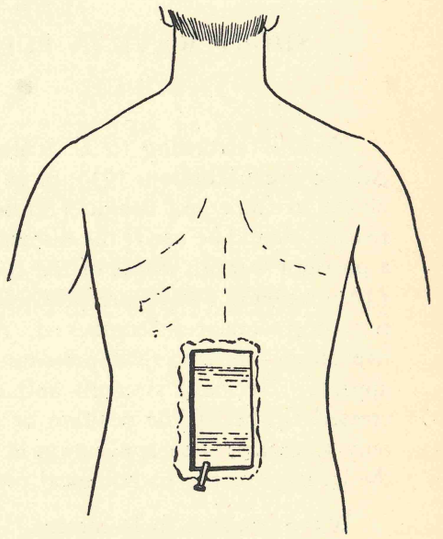


Fig. 12

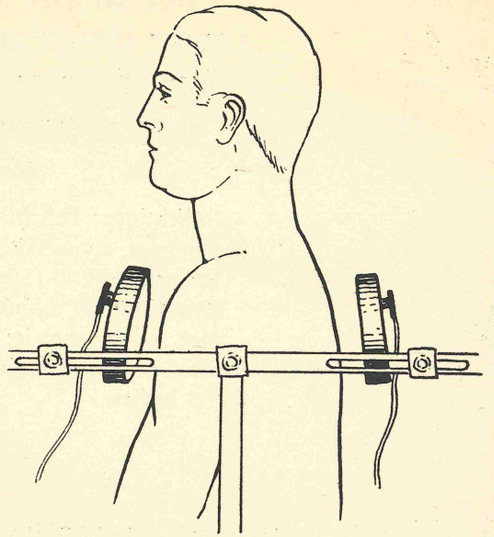


Fig. 13

SHORT WAVE IN PULMONARY DISEASES

●

Technic according to E. Schliephake (*Short Wave Therapy*, Actinic Press, London, 1935, p. 183): Use plates of a diameter of 20 cm in front and behind [Schliephake does not state what air spacing should be used] the diseased side. Patient should feel only a pleasant warmth inside of the chest. Begin with short treatment (10 minutes), watch carefully. No change noticeable until duration of treatment is lengthened. As a consequence of pulmonary hyperemia a feeling of oppression in the chest and mild dyspnoea appears. The field strength and duration must then not be increased further. [The position of the plates in the illustration is only schematic. The application in the individual case depends on the location of the pathological process.]

Wave length 6 to 16 meters.

Treatments first daily, then 3 times a week.

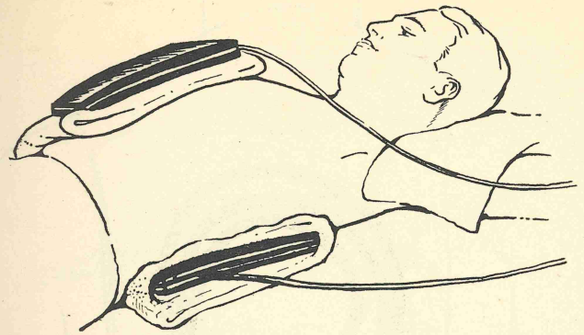


Fig. 14

SHORT WAVE THROUGH VERTEBRAE AND INTERNAL ORGANS (LIVER, SPLEEN, KIDNEYS, LUNGS) HIP JOINT

●

Soft rubber electrodes 5 x 8 inches must be placed according to location of pathological process.

Indications: Rheumatoid arthritis of spine and hip joint, Strumpel-Marie, Cirrhosis of liver, glomerulo-nephritis, unresolved pneumonia, asthma bronchiale.

Intensity: gentle heat.

Duration: 15 to 20 minutes.

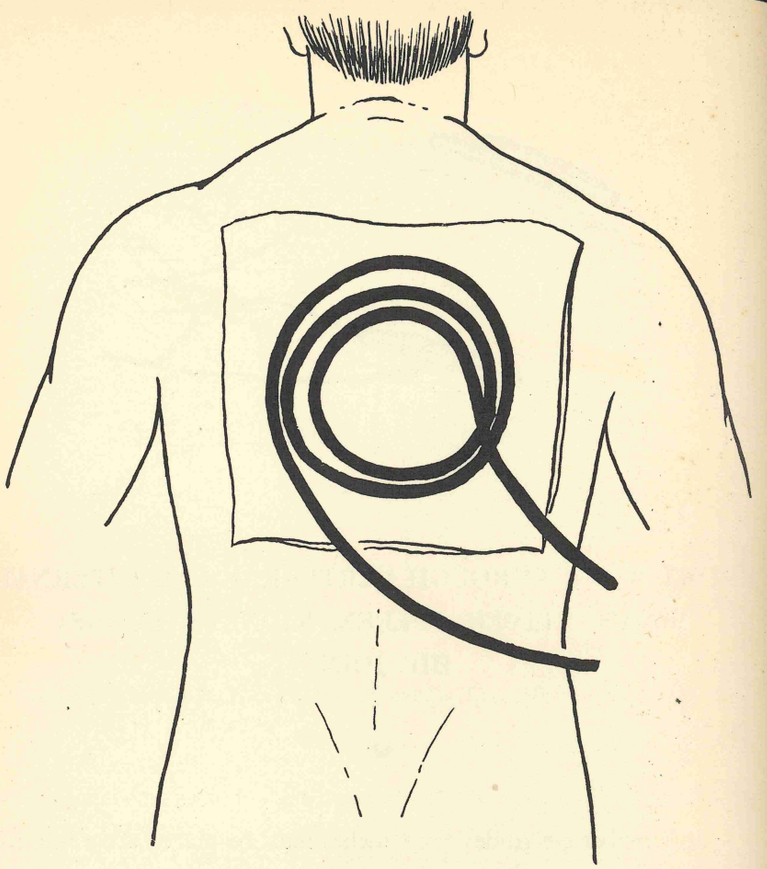


Fig. 15

INDUCTION COIL IN THE FORM OF A PANCAKE

The coil can be used for the treatment of myositis and spondylitis (indicated by above illustration). It can also be applied to the heart region (angina pectoris), to the abdomen (spastic constipation), to the perineum (patient sitting on it) (prostatitis); mastitis.

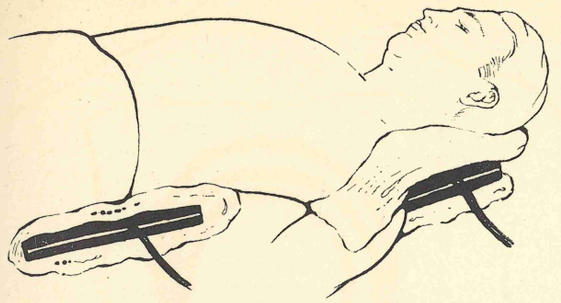


Fig. 16

SHORT WAVE THROUGH THE SPINE LONGITUDINAL DIRECTION

(The lines of force going from one electrode through the spine to the other electrode)

Indications: Spondylitis of all types; poliomyelitis in the early paralytic stage.

Intensity: Gentle heat.

Duration: 10 minutes in acute and subacute infectious spondylitis,

15 to 20 minutes in poliomyelitis.

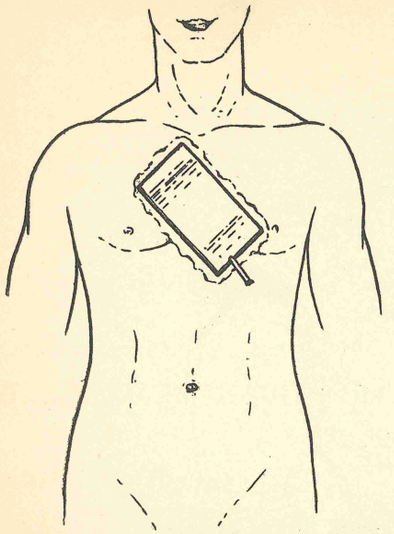


Fig. 17

DIATHERMY THROUGH AORTA AND HEART

Indication: Effort angina.

Intensity: 1000-1200 M. A.

Duration: 30 minutes.

Size of Electrodes: Anterior 3 x 6 inches, posterior 4 x 7 inches.

Frequency: Daily for months and even for years.

Anterior electrode must lie over the aortic valves.

DIATHERMY TO CHEST

Indications: Pneumonia, unresolved pneumonia.

Intensity: 2500-3000 M. A. for 30 minutes, 1 to 4 times daily, depending on effect.

Equally large electrodes, 5 x 8 inches, anteriorly and posteriorly over the diseased lobe.

In double pneumonia plates can be placed laterally, current going from one side to the other.

In cases of severe bronchitis with asthma the plates should be placed anterio-posteriorly over mediastinum.

Intensity: 1800-2000 M. A. daily.

Duration: 30 minutes.

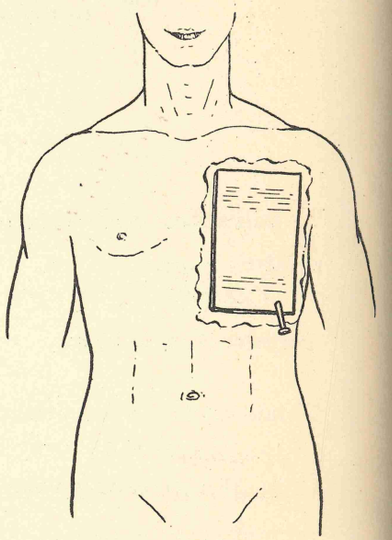


Fig. 18

DIATHERMY THROUGH ONE FINGER

Indication: Injury to finger.

Intensity: 200 - 300 M. A.

Duration: 30 minutes.

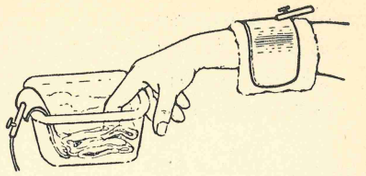


Fig. 19

DIATHERMY AND IONIC MEDICATION THROUGH ALL FINGERS

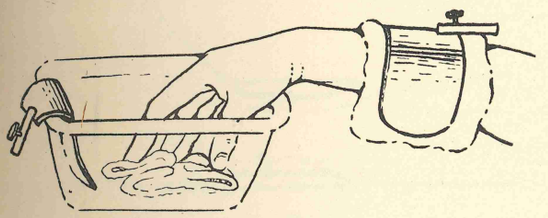


Fig. 20

Indications: Arthritis, injuries.

Intensity of Diathermy current: 400-600 M. A.

Duration: 30 minutes.

Intensity of Galvanic current: 10-30 M. A., positive pole in basin when using Mg^{2} SO_{4}, Na Cl.

Duration: 20-30 minutes.

DIATHERMY THROUGH HAND

Indications: Injuries, arthritis, acute trigger finger.

Intensity: 600 - 800 M. A.

Duration: 30 minutes.

Size of electrodes: 2½ x 3 inches.

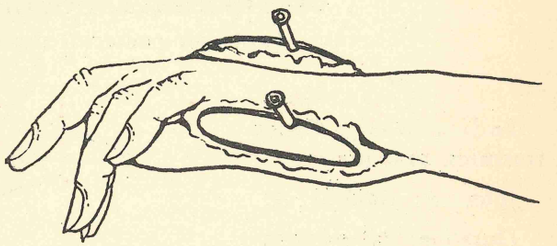


Fig. 21

DIATHERMY THROUGH FINGERS OF BOTH HANDS

Indications: Acroparesthesia, injury to fingers, chronic arthritis of phalanges and metacarpal bones.

Intensity: 400 - 600 M. A.

Duration: 30 minutes.

Same technic for ionization.

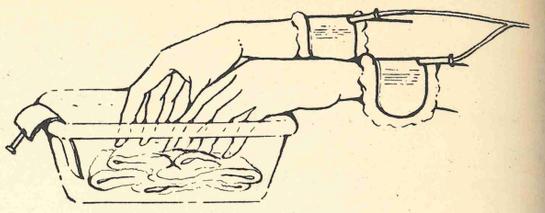


Fig. 22

DIATHERMY THROUGH WRIST
(lateral direction)

Indications: Colles' fracture with pain in the ulnar distribution, styloiditis, arthritis.

Intensity: 800-1000 M. A.

Duration: 30 minutes.

Size of electrodes: 1½ x 3 inches.

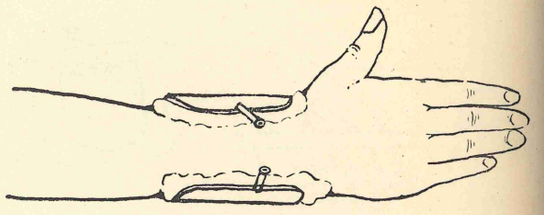


Fig. 23

The same technic for ionic medication with positive pole on ulnar side, in ulnar neuritis; over the styloid process in styloiditis.

DIATHERMY THROUGH WRIST
(anterior-posterior direction)

Indications: Colles' fractures, arthritis.

Intensity: 1000 M. A.

Duration: 30 minutes.

Size of electrodes: 2 x 3½ inches.

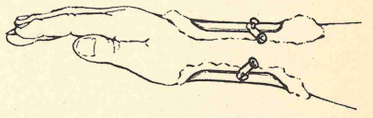


Fig. 24

DIATHERMY THROUGH WRIST
(longitudinal direction)

Indications: Arthritis, styloiditis, injuries.

Intensity: 700 - 900 M. A.

Duration: 30 minutes.

Note: Encourage motion during treatment.

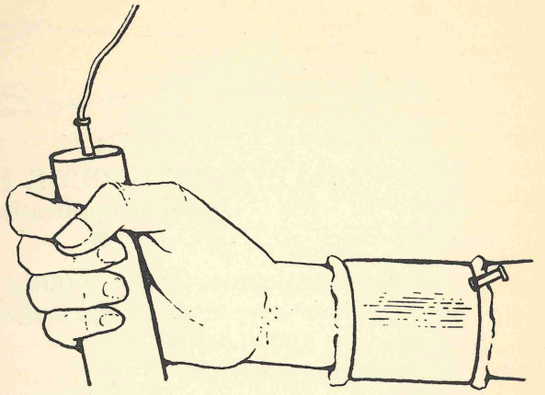


Fig. 25

SHORT WAVE THROUGH HANDS

Indications: Stiffness of finger joints due to arthritis, injuries, cellulitis, edema, trigger finger.

Intensity: produce comfortable warmth.

Duration: 10 to 15 minutes.

Encourage motion during treatments.

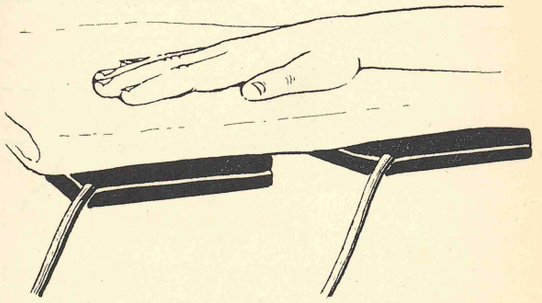


Fig. 26

This technic is preferable to placing hand between electrodes as active motions during treatment are facilitated.

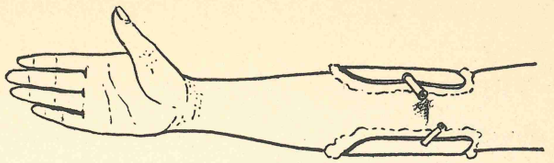


Fig. 27

DIATHERMY THROUGH ELBOW JOINT
(lateral application)

●

Indications: Injuries to joint, arthritis, ulnar neuritis due to injuries of ulnar nerve at elbow, epicondylitis, tennis arm.
Intensity: 1000-1200 M. A.
Duration: 30 minutes.
Size of electrodes: 2 x 3½ inches.

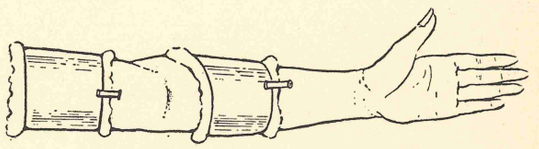


Fig. 28

DIATHERMY THROUGH ELBOW JOINT
(longitudinal direction)

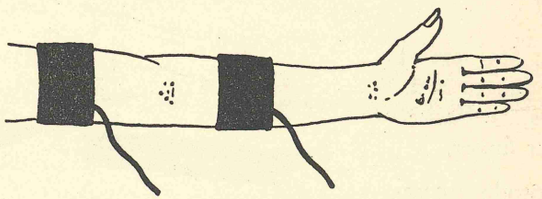


Fig. 28A

SHORT WAVE THROUGH ELBOW JOINT
(longitudinal direction)

●

Indications: Injuries, arthritis.
Intensity: Diathermy, 700-1000 M. A.; short wave, gentle warmth.
Duration: 30 minutes.
Encourage motion during treatment.

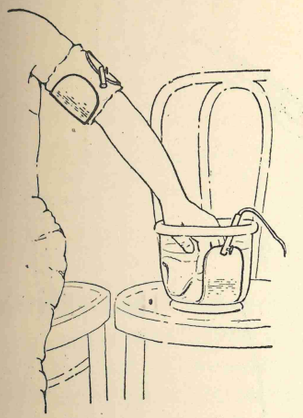


Fig. 29

DIATHERMY THROUGH WHOLE ARM
(longitudinal direction)

●

Indications: Muscular atrophy, poliomyelitis, peripheral nerve injuries.
Intensity: 600-700 M. A.
Duration: 30 minutes.
The same technic for stimulation with the sinusoidal current of all the muscles of the arm. If reaction of degeneration is present use interrupted galvanic current.

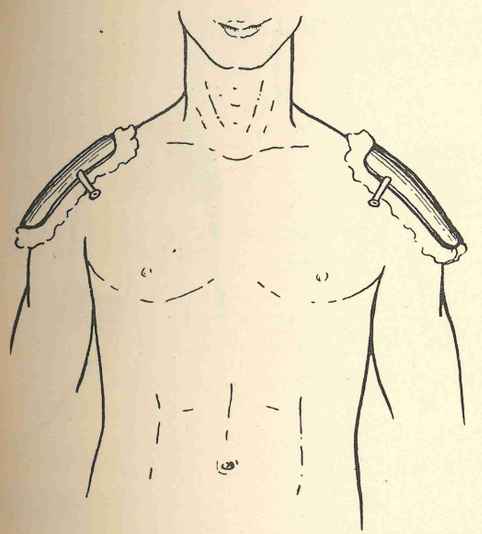


Fig. 30

DIATHERMY THROUGH BOTH SHOULDERS

●

Indications: Arthritis, bursitis in both shoulders.
Intensity: 1000 M. A.
Duration: 30 minutes.
Size of electrodes: 3 x 4 inches.

DIATHERMY THROUGH SHOULDER

●

Indications: Fracture and dislocation of shoulder joint, bursitis subacromoidalis of the chronic type.

A. For Injuries: Intensity: 1200-1500 M. A. daily.

Duration: 30 minutes.

B. For Bursitis subacromoidalis of infectious type:

Intensity: 900-1200 M. A.

Duration: 20 minutes, 2-3 times weekly.

The same technic for stimulation of deltoid muscle in atrophy of disuse, or injuries of the circumflexus humeri.

Size of Electrodes: 3 x 4 inches, active—on shoulder, 3 x 8 inches, indifferent—under the opposite arm.

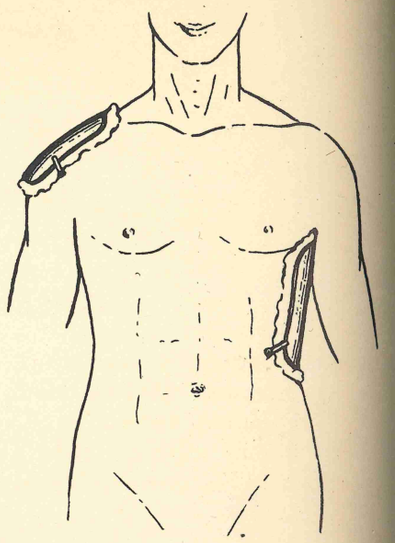


Fig. 31

SHORT WAVE THROUGH SHOULDER

●

Indication: Acute Bursitis.

Duration: 10-15 minutes.

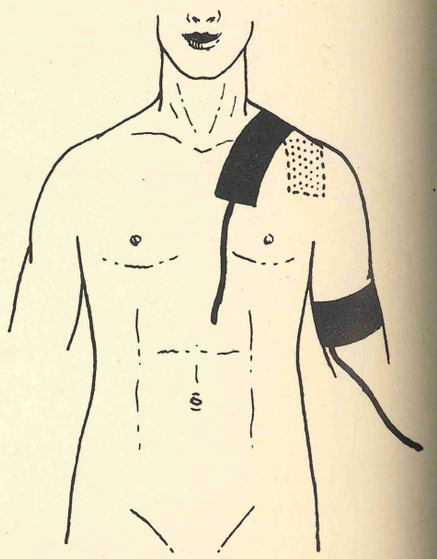


Fig. 31a

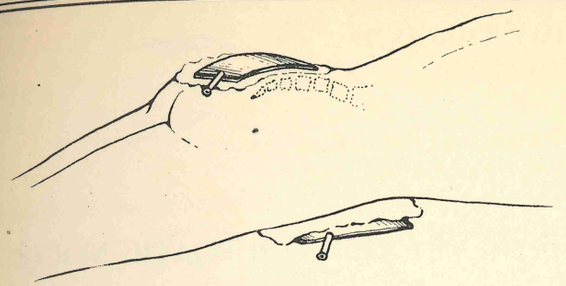


Fig. 32

DIATHERMY TO COCCYX

●

Indication: Coccygodynia.

Intensity: 800-1000 M. A.

Duration: 30 minutes.

Size of active electrode: 3 x 4 inches. The indifferent electrode 4 x 6 inches, one inch above pubic bone.

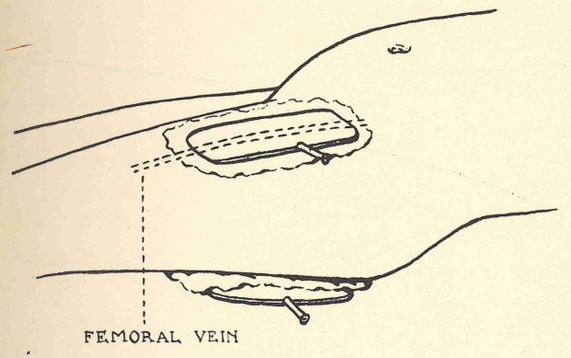


Fig. 33

DIATHERMY TO FEMORAL VEIN

●

Indication: Chronic phlebitis (do not treat periphery with heat).

Intensity: 1000-1200 M. A.

Duration: 30 minutes.

Size of electrodes:

Posterior plate 3 x 6 inches, upper thigh to buttock.

Anterior plate 2 x 5 inches, over affected vein.

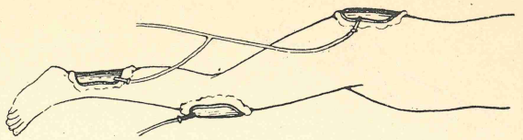


Fig. 34

DIATHERMY THROUGH SCIATIC NERVE

Indication: Sciatica of peripheral type.
Intensity: 1200-1500 M. A.
Duration: 30 minutes.
Electrodes: Three used. The electrode on the knee connected to one pole, the two other electrodes to second pole.

Size of electrodes:
On buttock: 5 x 5 inches.
On knee: 3 x 6 inches.
On foot: 2½ x 6 inches.

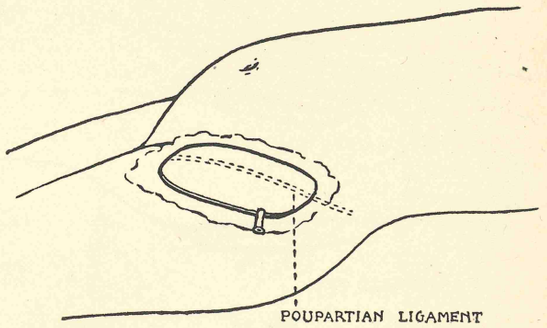


Fig. 35

DIATHERMY THROUGH HIP JOINT

(*The hip joint is located about an inch above the Poupartian ligament in the line from center of ligament to navel.*)
Indications: Injuries, chronic arthritis.
Intensity: 1200-1500 M. A.
Duration: 30 minutes.
Size of electrodes: 4 x 7 inches.

DIATHERMY TO KNEE (lateral direction)

Indications: Arthritis, injuries with exception of traumatic synovitis.
Intensity: 1200-1500 M. A.
Duration: 30 minutes.
Size of electrodes: elliptic 3 x 4 inches.

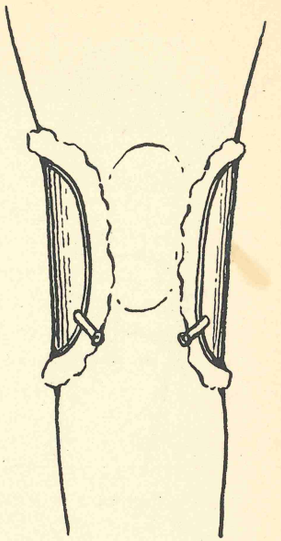


Fig. 36

SHORT WAVE THROUGH THE KNEE

(The technic of application is identical regardless of the part treated: hand, elbow, shoulder, upper spine, foot, ankle; the knee has been selected for illustration.)

Indications: Acute and subacute arthritis, injuries with swelling.

Intensity and Duration: For arthritis gentle heat for 10 to 15 minutes; for gonorrheal arthritis heat up to tolerance for one hour;

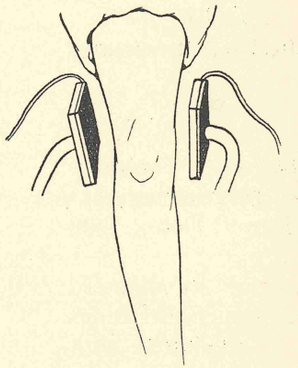


Fig. 37

For injuries: heat similar to diathermy for 30 minutes. NOTE: The condenser electrodes in this picture are illustrated to show air space. They are in fact usually padded with felt and tied to skin.

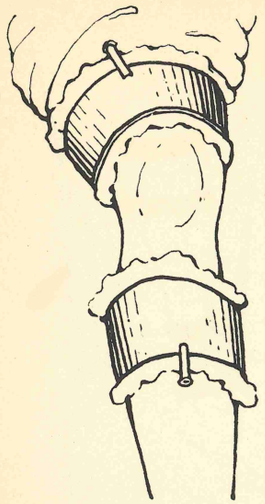


Fig. 38

DIATHERMY THROUGH KNEE (longitudinal direction)

●

Indications: Injuries, arthritis.

Intensity: 800-1000 M. A.

Duration: 30 minutes.

Size of electrodes: 2 x 15 inches, i.e. long enough to encircle the leg.

DIATHERMY THROUGH BOTH LEGS (longitudinal direction)

●

Indications: Thrombo-angiitis, Arteriosclerosis.

Intensity: 800 - 1000 M. A.

Duration: 30 minutes.

(The upper electrodes are both connected with one pole, the lower to the other.)

Electrodes sufficiently long to encircle the leg.

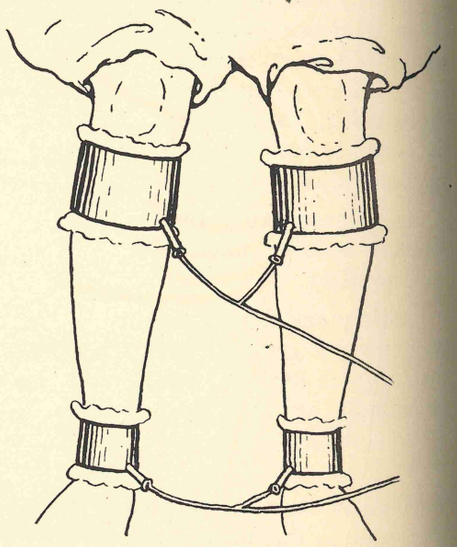


Fig. 39

SHORT WAVE THROUGH LEG (longitudinal direction)

●

Flexible condenser electrodes are applied above and below the part to be treated. The lines of force are strongest in the centre of the extremity. Care must be taken not to use too high energies to avoid injury to internal parts.

(This technic can be used on any part of an extremity but the electrodes should not be separated by more than 8 inches to avoid purely diathermy action, see page 14).

Indication: Inflammatory process in joints or bones.

Duration: 10-15 minutes.

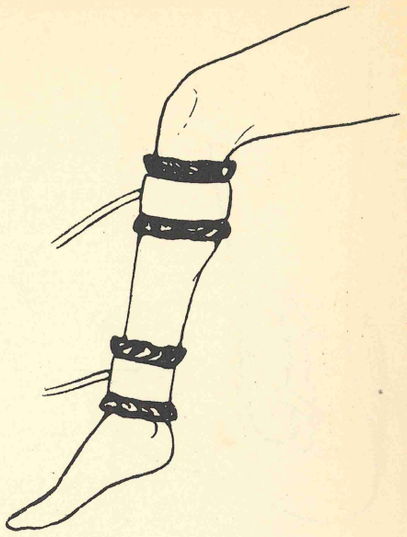


Fig. 40

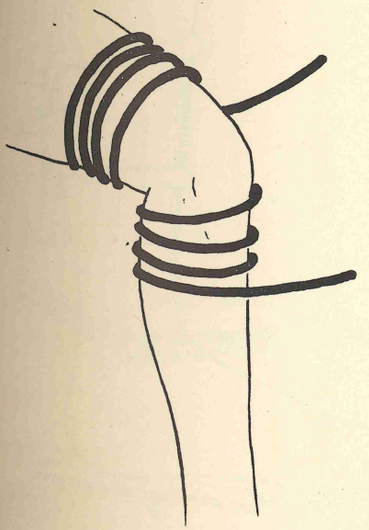


Fig. 41

INDUCTION COIL ELECTRODE TO THE KNEE JOINT

●

(The same technic can be used on other parts of upper and lower extremities.)

Indications and duration as given for short waves applied by cuff electrodes (see Fig. 40).

Special emphasis is laid on the fact that the maximum heating effect takes place in the region between the two sets of windings. *The intensity must be kept low to prevent severe internal burns.*

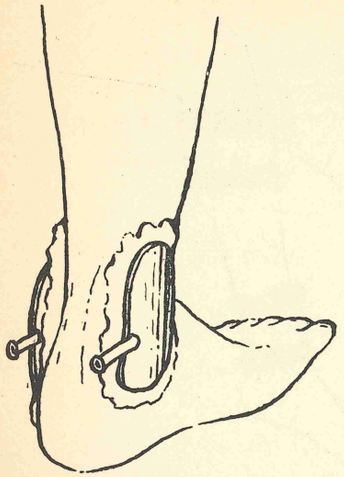


Fig. 42

DIATHERMY THROUGH ANKLE (lateral direction)

●

Indications: Potts' fracture, sprain, arthritis.

Intensity: 900-1000 M. A.

Duration: 30 minutes.

Size of electrodes: Bean-shaped, 1½ x 3 inches.

DIATHERMY THROUGH ANKLE (longitudinal direction)

●

Indications: Arthritis of ankle joint, Pott's fracture, myositis of the muscles in the sole of the foot.

Intensity: 500-700 M. A.

Duration: 30 minutes.

Size of Electrodes: 3 x 6 inches and cuff electrode to encircle the leg.

The same technic for stimulation of the muscles in the foot with sinusoidal current in cases of weak foot.

Fig. 43

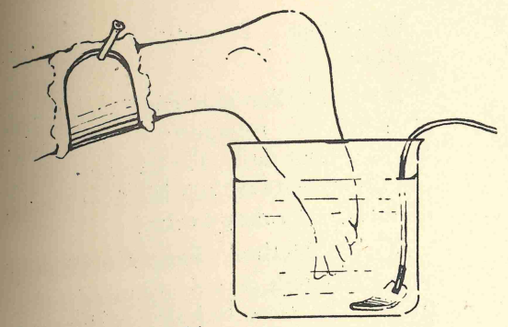


Fig. 44

DIATHERMY THROUGH TOES AND FOOT

●

Indications: Injuries to toes and metatarsus, intermittent claudication, arthritis.

Intensity: 700 M. A.

Duration: 30 minutes.

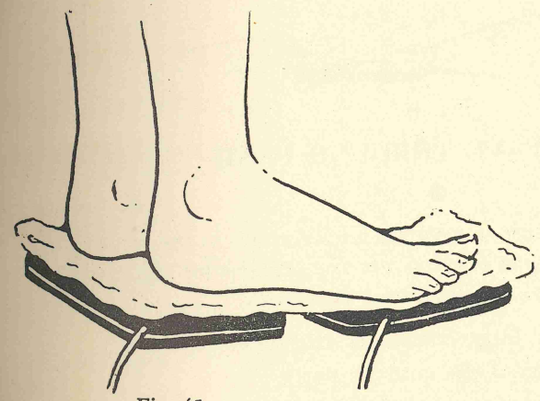


Fig. 45

SHORT WAVE THROUGH FEET

●

Indications: Arthritis, injuries, arteriosclerosis.

Intensity: produce comfortable warmth.

Duration: 15 to 20 minutes.

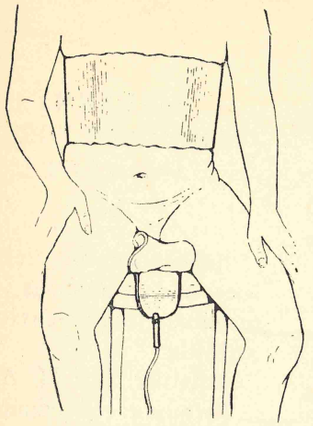


Fig. 46

DIATHERMY THROUGH PROSTATE

●

Indications: Prostatitis, edema of prostate.

Intensity: For gonorrheal conditions to point of tolerance — 1500-2500 M. A. 1 hour daily. For non-gonorrheal conditions—1000-1200 M. A., 15 to 30 minutes, 2-3 times weekly.

Wolf's Method: Patient sitting on active electrode 3 x 8 inches, belt-electrode. The same technic for the treatment of the pelvic floor and lower part of uterus.

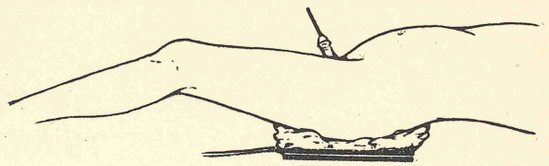


Fig. 47

SHORT WAVE THROUGH PENIS

●

(*The electrode in the penis is a condenser electrode in the form of a sound.*) *Inject 20 percent argyrol into the urethra for asepsis to prevent dissemination of organisms.*

The patient lies on a large condenser electrode.

Indication: Gonorrhea of the anterior part.

Intensity: Point of tolerance (110° F.)

Duration: 1 hour or more.

When using spark-gap apparatus do *not* go beyond 2nd or 3rd stop.

DIATHERMY THROUGH PARS PENDULA

●

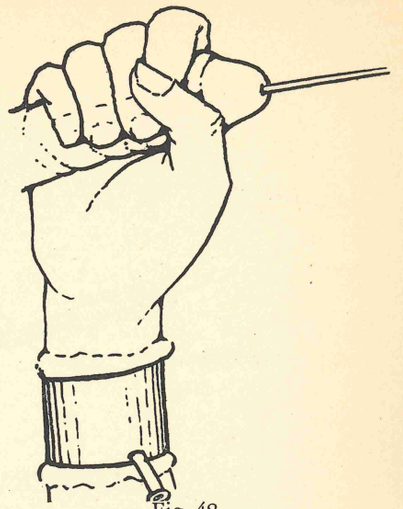


Fig. 48

Indication: Stricture of urethra (this method is not to be recommended for acute gonorrheal infection).

Intensity: Dependent on tolerance (size of sound).

Duration: 30 minutes.

Technic: Size of electrode depending on stricture, increasing size during session on improvement. The hand wetted with salt water closed as fist around penis serves as indifferent electrode.

For short waves the unipolar method can be used, employing a condenser electrode of glass or hard rubber of adequate size.

SHORT WAVE IN FORUNCULOSIS AND FOR CARBUNCLES

●

Use electrodes with convex contact surface to avoid pressure, or pad with dry cotton.

Start with 15 minutes, daily.

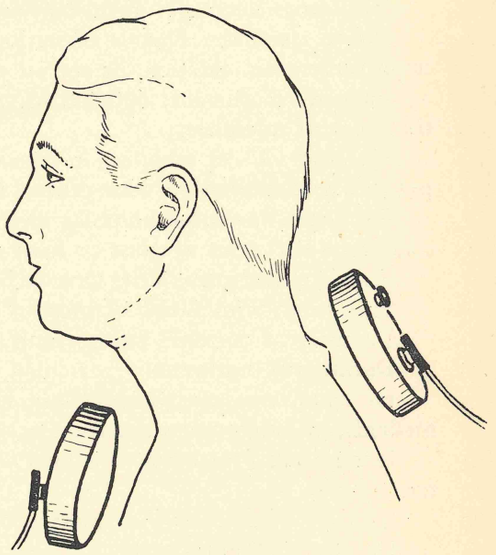


Fig. 49

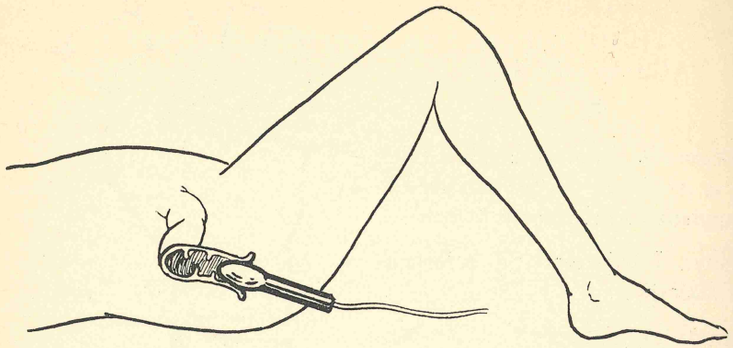


Fig. 50

DIATHERMY TO RECTUM

●

Indications: Fissura ani, spasm of sphincter, stricture of rectum, prostatitis, gonorrhea of prostate.

Indifferent electrode: metal belt around hip, 3 inches wide.

Active electrode: Sounds of various sizes increasing with the improvement vis. dilation, or special prostatic electrodes.

Intensity of current: 600-700 M. A. In case of gonorrhea to the point of tolerance.

Duration: 15-30 minutes. In case of gonorrhea, 1-3 hours, if possible in combination with general hyperpyrexia.

For short waves the unipolar method can be used, employing condenser electrodes of glass or hard rubber of adequate size.

For sinusoidal current the same technic is used as for diathermy.

Indication: Stimulation of muscles of the pelvic floor (atony).

Intensity of current: Strong contraction.

Duration: 15 minutes.

For static wave current and Oudin electrode, which are unipolar methods, no indifferent electrode is needed, otherwise same technic.

Indications: Prostatitis, weakness of bladder and rectal sphincter.

Intensity of current: Full contractions.

Duration: 15 minutes.

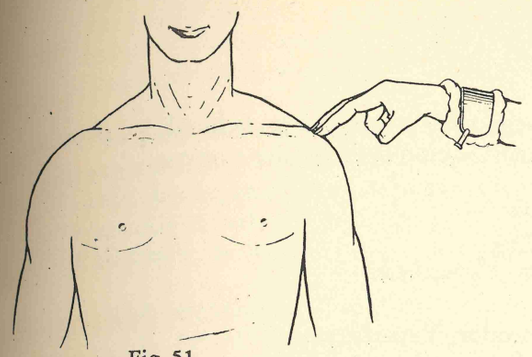


Fig. 51

INDIRECT DIATHERMY

●

Indications: Bursitis subacromoidalis, sinusitis, neuralgia of upper orbital nerve.

Intensity: Determined by heat sensation in operator's hand.

Duration: 15 minutes.

AUTOCONDENSATION

●

A method of applying high frequency currents for therapeutic purposes. The treatment is administered as follows: One terminal of the high frequency generator is connected to a long metal plate. Over this strip of metal is placed a cushion, which serves as a dielectric, its thickness depending on the voltage. The dielectric may be a thin sheet of fiber or bakelite, or it may be a mattress, stuffed with hair or silk floss several inches thick. The patient, sitting or lying on the cushion, generally holds in his hands a metal bar which is connected to the other terminal. This is analogous to the construction of a Leyden jar, the metal strip corresponding to the inner coating or tinfoil of the jar; the glass dielectric to the mattress or fiber pad; and the patient to the outer coating of the jar. Hence it will be seen that this condenser, of which the patient is one plate, is alternately and with great rapidity charged and discharged, first positively and then negatively.*

Indication: Arterial hypertension.

* *"Handbook of Physical Therapy,"* Amer. Med. Asso. Chicago, 1932.

HYPERPYREXIA

●

WE ARE CONCERNED here with hyperpyrexia induced by physical means. Various procedures may be employed for this purpose:

Diathermy

Short waves: Radiotherm, Hypertherm

Moist hot air: Hyperpyrexator, Vapotherm

Hot water: Hydro-eneciator and hot full bath

Hot electrical blankets

In this book only the diathermy method is illustrated, as any diathermy apparatus, which is free from faradic effects and has sufficient capacity can be used for this purpose. Users of the other apparatuses mentioned above obtain thorough instructions for handling them from the manufacturers.

Preparation of the patient for all forms of hyperpyrexia:

The patient should receive an enema the day before and void before treatment. He should have no meal before the treatment.

The hyperpyrexia treatment is rather disagreeable to patients, particularly if temperatures above 105 degrees are required and the treatment has to be prolonged for from four to six hours. With some patients good nursing can do a great deal and they can be persuaded to endure it. Other patients require sedatives—morphine ¼-½ gr. or luminal ½ gr. or both.

The head should be cooled steadily with ice. Some patients prefer to have a fan playing on their head.

Ordinarily a patient may get as much fluid to drink as he likes, unless it is desired to bring about dehydration. In this case fluids should be administered more sparingly. To replace NaCl lost in sweat, salt may be added to drinking water.

Patients lose a great deal of lactic acid in the course of a long treatment which may lead to an alkalosis. Bierman has shown that periods of apnoe may appear, lasting a minute, or shortness of breath. In such cases inhalation of carbon dioxide gas (6 to 25% CO^2 and the balance oxygen) is advisable, in order to relieve these disagreeable symptoms.

The temperature should be measured in the rectum every fifteen minutes. Mouth temperatures are very unreliable. Blood pressure needs to be taken only when it is above 150. It must be remembered that the systolic blood pressure is likely to rise under hyperthermy, while the diastolic falls. After the treatment the systolic pressure may fall far below the original level.

INDICATIONS: Syphilis of the central nervous system; general paresis; locomotor ataxia.

Form of treatment: Optimum temperature 105.4 to 106 degrees F. sustained for two hours and 104.5 for another four hours.

Gonorrheal affections, gonorrhea in female,* gonorrheal arthritis, gonorrheal tenosynovitis, some cases of gonorrhea in male.

Form of treatment: Raise temperature as high as can be tolerated, even up to 107.5 sustained for 3-4 hours. If possible, over terminal lethal temperature of the gonococcus in the particular case. Repeat treatment every second day. Sometimes two treatments suffice.

Multiple disseminated sclerosis, inflammatory type, particularly cases with inability to walk.

Form of treatment: Temperature 105 degrees F. for 2-3 hours, 2 or 3 times a week. Courses of ten treatments, sometimes 30 to 40 treatments.

---

*See combination of systemic fever and additional pelvic heating, Bierman and Horowitz, p. 84.

Arthritis (with exception of gonorrheal form no definite indication as to type is possible at present). Treatment acts probably only by elimination.

Form of treatment: temperature up to 104° F. for 2-3 hours, three times a week.

Encephalitis, post encephalitic Parkinson's disease.

Form of treatment: Temperature 105 to 106 degrees F. sustained for 2 or 3 hours, three times a week.

Corneal ulcer, acute iritis.

Form of treatment: 104° to 107° F. for 4 to 5 hours, 2-3 treatments.

HYPERPYREXIA BY DIATHERMY

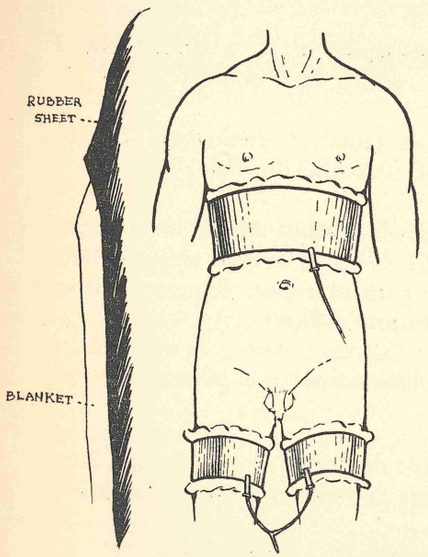


Fig. 52

Belt electrode 7 inches around lower part of chest and upper abdomen (stay away from hip bone); one cuff electrode 6 inches wide on each leg just above knee. These two can either be short circuited or connected individually with one pole.

All electrodes heavily padded with towels soaked in 15% salt solution.

Intensity: 2500-3500 M. A.

Connections must be well protected with wires soldered to electrodes, if possible, to prevent separation. Electrodes are fixed to the body with rubber bandages.

Patient to be wrapped in rubber sheets and blankets to prevent heat loss by radiation. Measure rectal temperature only when current is turned off.

LOW FREQUENCY LOW VOLTAGE CURRENTS

(GALVANIC, FARADIC, SINUSOIDAL)

Galvanic

Galvanic current is a steady unidirectional current produced by chemical action in multiple dry or wet cells, or obtained from a direct current lighting or power circuit, or from an alternating current circuit by the introduction of (a) motor generator, (b) rectifier, and (c) B-Battery eliminator.

Faradic

Faradic current is an intermittent, alternating current induced in the secondary winding of an induction coil.

Sinusoidal

Sinusoidal current is an alternating current following the sines law and of such frequency as to afford the opportunity of separate (clonic) muscular contractions.

These forms of current have a chemical and therefore stimulating action on body tissues.

Ionic Medication

Under ionic medication we understand the process of introducing substances into the body by the electrolytic action of the galvanic current. Only galvanic current can be used for this purpose as it is unidirectional.

To introduce a metal into the body soak a piece of cotton with a solution of salt containing this metal, take a plate corresponding in size to the area to be treated and wrap it thoroughly in the cotton. Place it on the seat of the pathological process and connect with the positive pole. For copper ionization use copperplates, for zink ionization zink plates.

Never use iron needles or plates with the positive pole on account of oxidation.

To introduce a radical (chloride, iodine, salicylates) connect the active electrode with the negative pole.

To determine polarity put both ends of both wires into salt water and turn on current. Where a greater amount of bubbles appears (hydrogen) is the negative pole, the cathode; where few bubbles appear (oxygen) is the positive pole, the anode.

The process by which neutral atoms or molecules become charged either positively or negatively is called Ionization. It is the basis of ionic medication.

Indications: Torpid ulcers, fistulas, arthritis with active foci, ankylosis, sciatica, brachial neuritis, trifacial neuralgia, endocervicitis, atrophic rhinitis, internal hemorrhoids.

The electrodes used must be well padded to avoid point action.

Intensity of current—depending on size of electrodes—5 to 100 M. A.

Duration: 5 to 30 minutes.

IONIZATION "DONT'S"

Don't use bare metal plates but only padded electrodes to avoid burns.

Don't turn the current on or off suddenly, to avoid shocks.

Don't apply current without making sure what pole you want and what the polarity is.

Don't use ordinary wall plates if large plates and high amperage (300-500 M. A.) are needed, but only ground-free currents, that is, produced by motor generators.

IONIC MEDICATION TO ALL THREE BRANCHES OF THE TRIFACIAL NERVE

●

Indication: Trifacial neuralgia.

Intensity: 15-20 M.A.

Duration: 20-30 minutes.

Quinine or magnesium sulphate or salt solution. The positive pole in front.

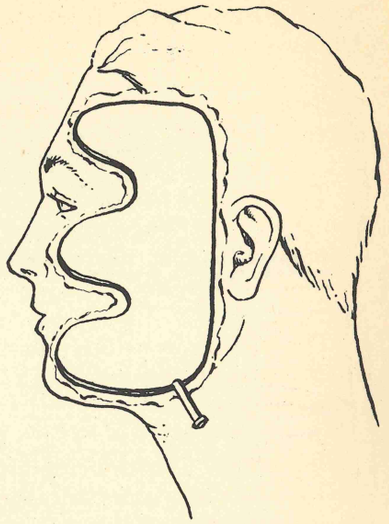


Fig. 53

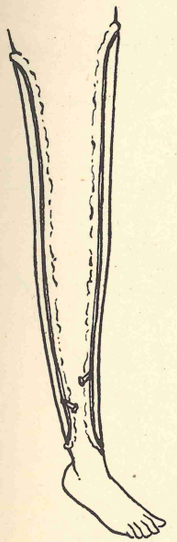


Fig. 54

IONIC MEDICATION TO SCIATIC NERVE

●

Indication: Peripheral involvement of sciatic nerve.

Intensity: 50-100 M.A.

Duration: 20-30 minutes.

Size of electrodes: 2½ inches wide, length depending on length of leg. Positive pole over the nerve.

Use either salt solution, magnesium sulphate or salicylates.

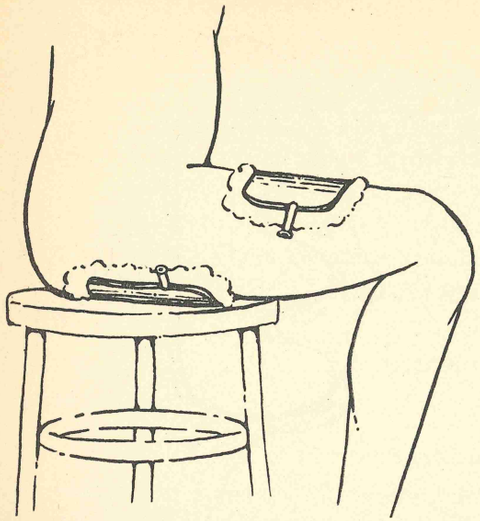


Fig. 55

ELECTRICAL (SINUSOIDAL) STIMULATION OF THE QUADRICEPS MUSCLE

●

Indications: Athrophy from disuse after knee injuries, loss of tone.

Intensity: sufficient to cause good contractions.

Duration: 15 minutes.

Size of electrodes: 3x4 inches.

INTERRUPTING HANDLE AND THREE-WIRE METHOD

●

Three-wired method for testing electrical reactions and stimulation of muscle when automatic interrupters are not available.

One free end with large (indifferent) electrode 3 x 5 on any part of the body, the other free end is connected to hand electrode (button electrode). From there another wire leads to the active electrode which is placed on the muscle or nerve to be tested. The interruption of the current is done with the other hand.

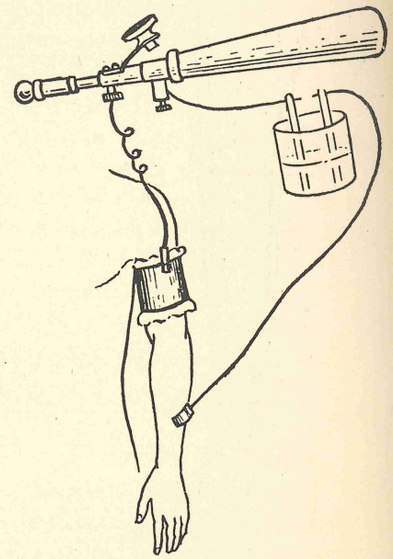


Fig. 56

ELECTRO-DIAGNOSIS

●

Place dispersive electrode somewhere on the body, the active one on the muscle to be tested.

Reaction of the normal muscle:

Galvanic current: Cathode closing contracture (CCC) greater than
Anode closing contracture (ACC)
Contraction wave lightning.

Faradic current: Contraction prompt.

Reaction of degeneration:

Partial: CCC equal or smaller than ACC.
Contraction wave slow
No faradic response.

Complete: CCC smaller than ACC.
Contraction wave wormlike

Reaction of degeneration is due to disturbances in the peripheral neuron. Normal reaction indicates a mild pathological process and a good prognosis (1-3 months).

Total reaction of degeneration indicates a severe process. Prognosis doubtful. Recovery, if at all, not to be expected before 6-8 months.

Improvement shows itself first in the quickening of the contraction wave, then in a change of the total reaction of degeneration into a partial one. CCC equal or greater than ACC.

Tetanic reaction (Tetany):
CCC greater than ACC.
Anode opening contracture (AOC) greater than ACC.
Hyperexcitability (Galvanic current of 1-2 M.A. sufficient).

Myasthenic reaction:

Muscle contractions produced by electrical stimulation are strong at the start, become weaker and weaker as the stimulations continue and cease eventually completely.

STATIC ELECTRICITY

●

Static electricity is electricity produced by friction. It is a high tension, direct current and is produced by influence machines. The three modalities described in the following pages are generally used.

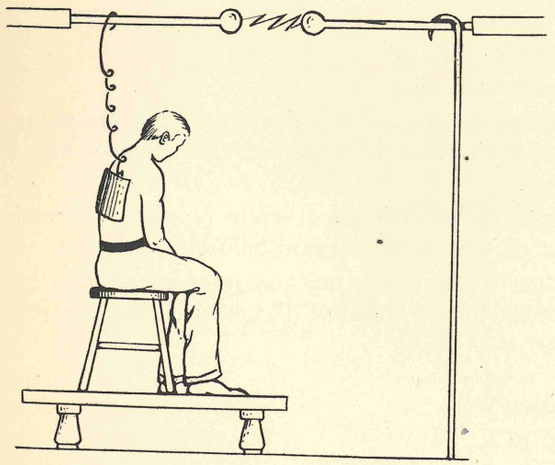


Fig. 57

MORTON WAVE CURRENT

●

Indications: To produce tissue contraction. Sprain, acute bursitis, stimulations of anal and bladder sphincter, atonic constipation.

Duration: 10-15 minutes.

Apply plate (or rectal electrode) to part to be treated, connect with negative pole. In case of atomic constipation place the electrode on the abdomen. For the rectum the usual prostatic electrode can be used.

STATIC SPARKS

●

Indications: Myositis, lumbago, chronic bursitis subacromoidalis, sciatica, calcaneus spur.

Direct sparks to the affected part. To direct sparks more accurately one may touch the part to be treated with an insulated rod and send the spark into the rod.

Regulate length of spark according to intensity desired by separating the globes.

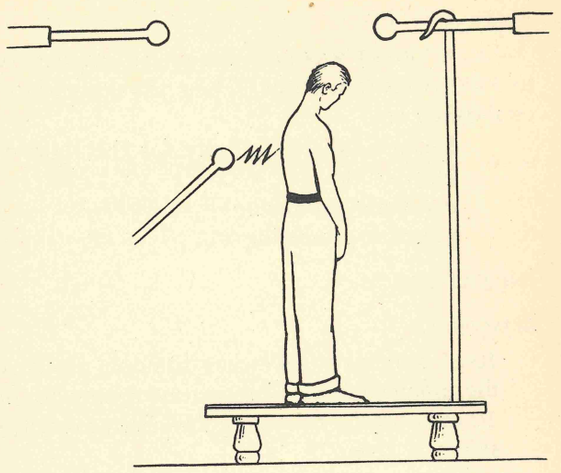


Fig. 58

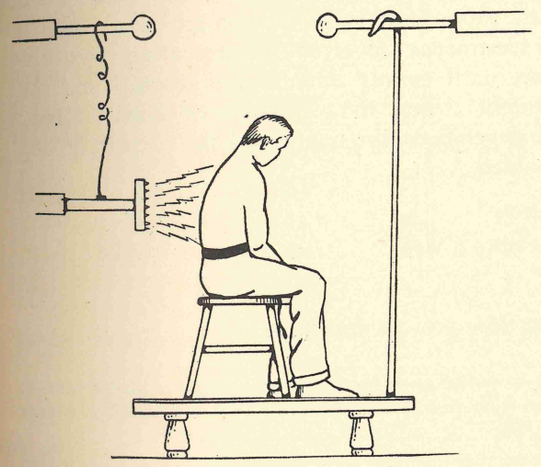


Fig. 59

STATIC BRUSH DISCHARGE

●

Indications: Stimulation of the skin, neuritis.

Duration: 2-5 minutes.

Direct to part to be treated.

ULTRAVIOLET RADIATION

●

ULTRAVIOLET RAYS are the electromagnetic waves ranging from 2000 to 3300 Angstrom Units. Their physiological effects which are definitely established are

bactericidal, particularly for the short wave range
antirachitic
erythema producing
pigment producing

INDICATIONS:*

Erysipelas:

10-15 minutes at 18 inches distance; protect the skin up to one inch of the inflamed area. One treatment may be sufficient. If not, repeat for 10 minutes the following day. Better results seem to be obtained if no serum is given.

Rickets:

The entire body, the back and the front alternately, is exposed to the light, starting with three minutes at a distance of about 3 feet, when using the mercury quartz vapor lamp or the carbon arc lamp (with B and C carbons). The treatments are given on alternating days, one minute more each time, until twenty minutes are reached and the lamp is gradually brought closer, to a distance of about 2 feet. The increase of dosage depends on the reaction of the patient. Strong erythema should be avoided.

Alopecia due to skin infection:

10 minutes at 24 inches once a week.

Neuritis:

An erythema producing dose acts as derivative.

*NOTE: An accurate dosage can not be given because the effect depends on the strength of the lamp and the reaction of the individual patient which in turn is determined to a large extent by the pigmentation of the skin.

The lamp at 18 inches is not twice but 4 times as strong as at 36 inches. Light source at 90 degree angle is twice as strong as at 30 degree angle.

Colitis:

General irradiation starting with 2 minutes at 30 inches increasing dose daily by one minute; and local irradiation to abdomen, starting with 3 minutes at 24 inches to produce erythema.

Secondary anemia:

Anemia patients can stand a much bigger dose than normal people. Start with 3 minutes at 24 inches, increase one minute a day.

Acne rosacea:

Starting with 5 minutes at 24 inches.

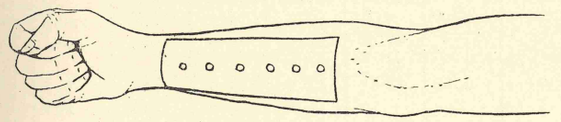


Fig. 60

DEVICE TO DETERMINE THE INDIVIDUAL SUSCEPTIBILITY OF A PATIENT TO A GIVEN SOURCE OF LIGHT

●

Cover the holes with paper; expose first hole for one minute, then expose 2nd, 3rd, 4th, 5th and 6th at 1 minute intervals, so that first hole was exposed 6 minutes and last one 1 minute. The holes which fail to show a reaction determine the suberythema dose.

Observe effect after 6 hours.

TABLE I

Energy-Emission of Light Sources *

(Microwatts per Square Centimeter at 1 Meter. Carbon Arcs, 30 Amperes, 50 Volts, A.C.)

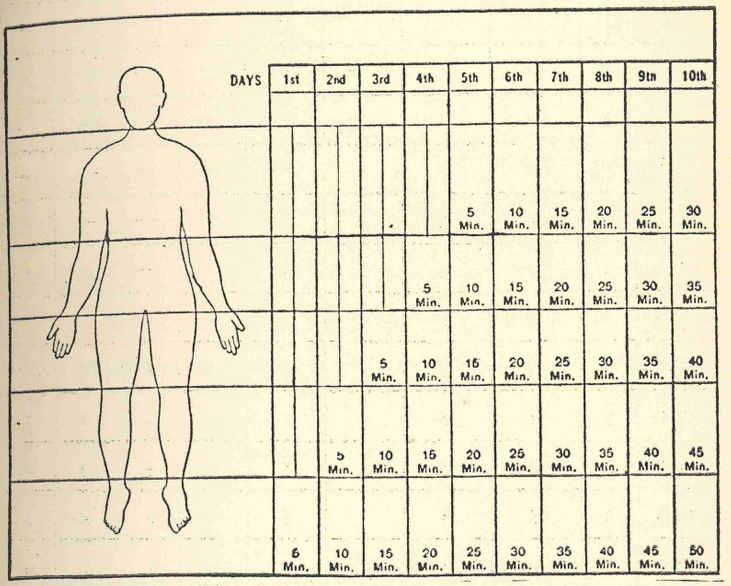
Wave Band	Bactericidal Rays	Antirachitic Rays	Tan- and Erythema-producing Rays	Heat Rays			Non-penetrating Heat Rays
	2300–2500	2500–2700	2700–3000	3000–3140	3140–4000	4000–7000	7000–10,000	Over 10,000
Noon fall sunlight	.....	.....	1.0	27.0	2380	35,710	24,490	28,100
Sunshine carbon	3 6	6.1	13.5	17.0	**646**	**2,431**	**1,348**	3,110
B carbons	20.0	35.0	**66.0**	**42.0**	629	703	382	3,780
C carbons	20.0	43.0	**67.0**	**63.0**	**817**	700	479	4,719
E carbons	4.0	4.6	9.4	5.7	206	**1,959**	690	**4,191**
K carbons	27.0	**27.0**	**32.0**	26.0	624	654	390	4,445
Mercury quartz 4A. 75 V.D.C.	5.0	18.0	**17.0**	**25 0**	80	152	25	1,323
S-1 bulb 115V	.....	.....	1.8	4.8	15	**167**	342	**2,130**
Cold quartz lamp	.....	**150.7**	2.5	7.9	.....	.....	.....	.....
Lepel lamp	5.0	**80.0**	**35.0**	**70.0**	100	.....	.....	.....
	Through Corex D							
Sunshine carbons	.....	.....	5.0	12.0	574	2,187	1,210	1,794
B carbons	.....	1.0	23.0	28.0	**563**	633	343	2,256
C carbons	.....	2.0	25.0	42.0	**725**	630	430	2,789
E carbons	.....	.....	3.0	4.0	184	1,764	620	2,542
K carbons	.....	1.0	11.0	17.0	**553**	588	342	2,576
Mercury quartz 4A. 75 V.D.C.	.....	1.0	7.0	17.0	80	136	22	495

* The figures in this chart represent the distribution in absolute energy units of some sources of radiation at the indicated wavelength. The boldface figures indicate which sources emit the rays strongest in physiological effect, characteristic of the particular wavelength range.

Guide for selection of the light source most effective in certain wave ranges. ..... Wolf, H. F., Textbook of Physical Therapy, p. 56.

TABLE II

Rollier's Method for General Radiation with Sunlight in Tubercular Cases



Rollier's schematic diagram of insolation, showing progression by which patient is exposed to sun.

From: KRUSEN, F. H.

Light Therapy

New York, Paul B. Hoeber, 1933

TABLE III

McKENZIE AND KING'S METHOD FOR FRACTIONAL IRRADIATION WITH QUARTZ LAMP IN TUBERCULAR CASES

Figures represent minutes. Lamp at 3 feet distance.

Day	Face	R. Arm	L. Arm	R. Leg	L. Leg	Chest	Abd.	Back	Butt.
1st	1	1	—	—	—	—	—	—	—
2nd	2	1	—	—	—	—	—	—	—
3rd	3	2	1	—	—	—	—	—	—
4th	4	3	2	1	—	—	—	—	—
5th	5	4	3	2	1	—	—	—	—
6th	5	5	4	3	2	1	—	—	—
7th	5	5	5	4	3	2	1	—	—
8th	5	5	5	5	4	3	2	1	—
9th	5	5	5	5	5	4	3	2	1
10th	5	5	5	5	5	5	4	3	2
11th	5	5	5	5	5	5	5	4	3
12th	5	5	5	5	5	5	5	5	4
13th	5	5	5	5	5	5	5	5	5

On the fourteenth to the twenty-first day, the anterior aspect is irradiated for five minutes. From the twenty-first to twenty-eighth day, the posterior aspect is irradiated for five minutes. On the twenty-eighth to thirty-fifth day, the anterior aspect is irradiated, and so on.

McKenzie, F. C., and King, A. A.
Practical Ultra Violet Light Therapy
New York, Wood, 1926, p. 87.

MINOR ELECTRO-SURGERY

HAIR EPILATION

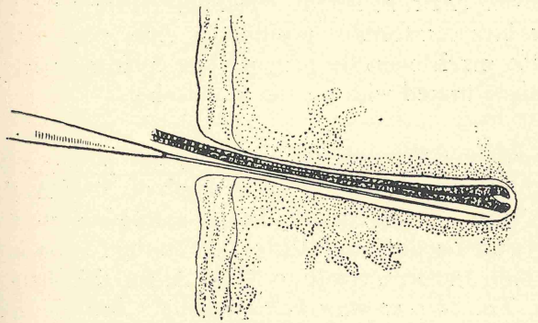


Fig. 61

Correct insertion of the needle into the follicle.

●

By Diathermy:

(According to the technic of Dr. Julius Raab.)

The following equipment is necessary:

The cutting current of the diathermy apparatus
A special milliammeter graduated up to 100-250 M.A.
A foot switch
A holder for the epilation needle
A hand electrode (as indirect electrode)
A binocular magnifying glass in a frame with adjustable focus
Epilation needles about 2-3 cm long and 2-3 mm thick

Connect special milliameter to lowest strength of current and attach needle holder to this cord.

Indifferent electrode from zero-marked outlet.

Put needle in holder, attach foot switch.

The patient is placed in a lying position, a 100-Watt daylight lamp is adjusted about ½ meter above the epilating part. The operator is seated on a revolving chair, its height depending on the height of the table. He should be in a comfortable position in order not to strain his back by bending too much over the patient. The epilating part is cleansed with cotton pads saturated with benzin and alcohol.

Put indifferent electrode (monopolar) into patient's hand, step on the foot-switch. If the ammeter shows strength of 20 M.A. the machine is set correctly. Turn off the current. Leave indifferent electrode in patient's hand, introduce needle into follicle, step on the foot-switch again, observe carefully milliameter, increase to 35 M.A. for thin hair, to 65 M.A. for thick hair. *The current must be turned off when the needle enters or is withdrawn.*

The current should flow through the needle from 2-3 seconds and only in exceptional cases a few seconds more, in the average 2-3 seconds will suffice. The number of seconds depends upon the same factors which play a role in determining the strength of the current, that is the thickness of the hair and the sensitivity of the patient.

The needle should reach a *depth of about ½ cm,* providing the underlying tissue of the skin will permit this depth. Epilation over a bony area, like the mandibula of a thin person, will allow much less penetration than ½ cm. Where the needle cannot be inserted deep enough, reactions may set in very easily. When observing this, the duration of the epilation should be shortened, and if this fails to overcome the reaction, the strength of the current should be lowered.

Scar formation must be avoided. For this the reaction must be observed. Normally after every epilation a redness occurs at its site, which last from a few hours to a day. If a blister of a white-grayish discoloration appears the skin is too sensitive or the technic was faulty and a bad scar will result.

To avoid complications due to sensitive skin, at the first sitting only a few hairs should be epilated and the reaction observed (epilation test). If no reaction appears at the site of epilation, a few more hairs can be epilated at the same sitting. No reaction should be noticeable on the next day. If the skin is still red this must be regarded as a warning. In this case the intervals between sittings must be lengthened. After 8 to 10 days the skin must be examined. If marks are present, the test must be repeated. If the same unfavorable marks appear again, the patient should be rejected for further epilation unless she accepts the full responsibility.

By Galvanic Current

Equipment as on page 61, but instead of a diathermy machine, a galvanic set composed of 8 dry batteries, milliameter registering up to 5 M.A. and rheostat.

Dispersing electrode on body.

Connect holder with negative pole.

Insert needle deep into follicle.

Turn on current slowly up to about 1 M.A.

Watch for appearance of hydrogen bubbles.

Maintain current for 5 seconds.

Turn off current, withdraw hair.

OBLITERATION OF INTERNAL HEMORRHOIDS WITH NEGATIVE GALVANISM

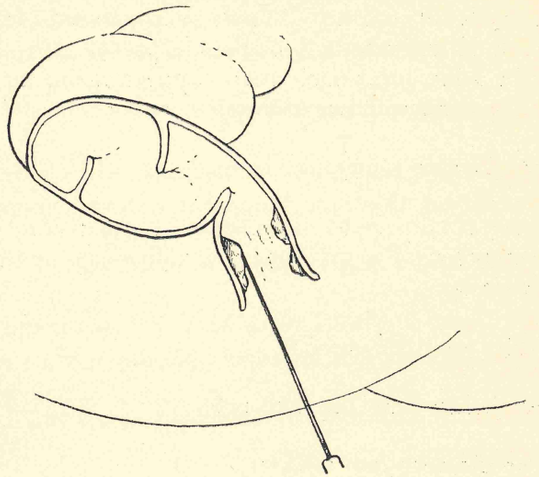


Fig. 62

Introduction of needle into an internal hemorrhoid for the purpose of coagulation by negative galvanism according to the technic of Keesey and of Matson

EQUIPMENT

Galvanic current generator

Large dispersive electrode

Brinkerhoff speculum

Rectal needle electrodes (Matson uses gold needle)

Hard rubber needle holder.

METHOD OF W. E. KEESEY

1. Give cleansing enema.
2. No anesthesia, as pain is used as a guide.
3. Patient lies on left side on moistened dispersive electrode.
4. Needle connected with negative pole.
5. Insert needle into uppermost hemorrhoid, where bright red mucous tissue is observed. Don't touch opposite wall of hemorrhoids.
6. Hold needle holder nearly parallel to rectal wall.
7. Turn on current slowly to 10-15 M.A. Patient should have no pain. If he complains technic is improper. Needle must be reinserted.
8. Discoloration to dark red and sometimes nearly black is sign of successful treatment.
9. Inject small quantity of 1% nupercaine ointment.

Internal protruding hemorrhoids are treated while prolapsed, one at a time. Replace after treatment.

Fissures, ulcers, perirectal abscesses, fistulas must be treated first.

Don't treat external hemorrhoids with negative galvanism.

Don't turn on the current before the needle is inserted.

Don't remove needle while the current is turned on.

METHOD OF DR. J. E. MATSON

Preparation—Have patient take high enema several hours before ionization.

Anesthesia—Inject 5 cc of nupercaine 4% into rectum just inside internal sphincter 15 minutes before divulgence.

Only treat one quadrant of rectum at a sitting, selecting the side presenting the most pathology for the first session.

First: Divulge.

Second: Insert Brinkerhoff speculum well above internal hemorrhoid.

Third: Withdraw blade, *only* enough to allow mucous membrane to bulge (not more than 1/4") into speculum, i.e., just enough to insert the gold needle (for not more than 1/8") into the mucous membrane. Connect with positive pole of galvanic current, 6 to 8 M.A. until the mucous membrane is blanched a first degree (only) namely a pearly white; turn off current and withdraw needle gently. If needle sticks reverse polarity to negative only 2 to 3 M.A. for only a minute and then turn current down to zero and withdraw needle.

Fourth: Holding Brinkerhoff firmly in position withdraw blade slowly until top of same rests on the pectinear line just above internal sphincter.

Fifth: Adjust sleeve on needle so that the latter when re-inserted will only go into hemorrhoids for about 2/3 the length of same.

Sixth: Holding needle parallel with blade of speculum insert needle into base of hemorrhoids 1/8" internal to the wall of the rectum, the full length up to the sleeve (as preadjusted according to instructions in step 5). Caution: See to it that your needle is absolutely parallel and 1/8" from the rectal wall at all times, so that there will be no contact of same with muscle of rectum; change polarity to negative, dosage 6 to 8 M.A., time until pile is pearly white and the hydrogen gas is bubbling freely around the sleeve held firmly (but gently) against base of pile. When pile is sufficiently blanched turn off current and leave needle in place.

Seventh: Withdraw needle slowly leaving only point, say about 1/8" inserted in hemorrhoid, change polarity to positive and turn only 2 to 3 M.A. until you see a slight deposit of green oxi-chloride of gold around needle point, then cut off current and withdraw needle gently. If stuck reverse polarity for a few seconds until needle slips out easily (with a little experience with the above technic, one can soon do bloodless hemorrhoidal work).

Eighth: Insert a quartz rectal applicator or quartz speculum and give rectum a third degree ultra violet radiation.

Ninth: Insert an anodyne rectal suppository and instruct the patient to keep bowels comfortably free and to insert a suppository after each bowel movement and at bedtime.

Tenth: Have patient return in three days for another third degree ultra violet treatment.

Eleventh: Three days later do another quadrant of rectum as above outlined and so on until patient is cured.

This method is particularly indicated in cases of extremely tight spastic sphincters and in neurotic patients.

ELECTRODESICCATION

Desiccation (formerly often called "fulguration") is the destruction of superficial tissues by sparks crossing from the point of the "desiccation needle" to the area treated. The desiccation current is usually obtained from the Oudin terminal of a diathermy machine by a monopolar technic.

With the high voltage available at the Oudin terminal very small amounts of current are sufficient for tissue destruction and the input regulator of the machine is therefore *placed at the lowest step.*

The length of the desiccation spark may be varied by varying the output voltage of the machine; in machines with variable gaps by shortening or lengthening the gap distance, in machines with fixed gaps by a regulator which affects the tuning of the patient's circuit.

Since long sparks carbonize the surface of the tissues treated, one should employ short sparks, 1/8" or less. In desiccating warts the needle is best inserted in the wart and the current shut off when a spark occurs. This shows that the tissues have been dehydrated. Then the needle should be withdrawn and inserted in another part of the wart. The dehydrated tissue blanches. It separates in about two weeks. For desiccation of warts no local anesthesia is needed if the spark is short.

If you wish to intensify the action of the current, ground patient by connecting metal bar in his hands to water pipe or steam radiator.

Use local anesthesia.

Indications: Xanthoma, small cysts about the eye, villous papilloma, nevus flammeus, moles, pedinculated polyps, corneal ulcers, granulations of the conjunctiva, papillomata of the tongue, epulis, growth on the inner side of cheek, uvula, veruca.

In treating villous papilloma the desiccating needle should be applied to the tips of the villae.

ELECTROCOAGULATION

Used for destruction of malignant tissues on account of its more intensive destructive capacity, and for the removal of large benign growths.

Place large dispersive electrode somewhere on the body, connected to the O-terminal.

Other terminal connected to a very small electrode (pointer, little metal ball).

In this technic the electromotive lines present a cone with the apex at the active, the base at the dispersive electrode. The greatest concentration is at the tip but sufficient concentration to cause destruction of tissue is also at a short distance away from the tip. The coagulating effect gradually fades away from the point of the electrode.

The depth of destruction varies with the strength of the current and the duration of application and the electrical resistance of tissues.

Try current first by using it on a piece of meat.

Instead of using the dispersive and active electrode technic one may use 2 active electrodes, that is, electrodes of equal size. The current action is not absolutely confined to the region lying between the electrodes.

There are many specially shaped electrodes manufactured for applying surgical diathermy to various parts of the body, such as the nose, throat, urinary bladder, cervix and others.

ELECTRIC CUTTING CURRENT

●

For cutting use needle or blade shaped electrode.

Connect to one terminal; the other terminal to a dispersive electrode placed anywhere on the body.

The tissues on either side of the incision are coagulated as the cut is made. The depth of this coagulation can be varied from the thickness of a thin film to several millimetres.

Vessels which the current does not seal are clamped and sealed by touching the clamp with the cutting electrode.

Larger vessels must be ligated as usual.

Coagula adhering to the electrode must be removed by a wire sponge or scraped off with some instrument, otherwise the effectiveness of the cutting current is diminished.

Ordinary diathermy machines do not supply the cutting current. There must be a special addition incorporated in the machine, or a separate unit.

Most surgeons using surgical diathermy cut the skin with a scalpel.

The advantage of the cutting current lies in its hemostatic action, in the effective destruction of malignant tissue and the sterilizing action.

It is therefore specially indicated in operating vascular tissues, liver and kidney, brain, in gastro-intestinal surgery (sterilizing effect), in operations on the tongue, oral mucosa, on the lip and face, for operation of epulis.

ELECTROTHERAPY IN OTOLARYNGOLOGY

(*from an unpublished manuscript*)

by

FAREL JOUARD, M.D.

ELECTROCOAGULATION OF TONSILS

●

(a) Electrodissection of Antero-External Surface

Technique:

1. High frequency machine set to deliver 1250 m.a. on short-circuit.
2. Patient pulls tongue forward, thus putting anterior pillars on a stretch.
3. Tongue depressor used if necessary.
4. Short, straight bipolar electrode applied between anterior pillar and tonsil.

   CAUTION: As far as possible avoid both pillar and tonsil proper.
5. Foot switch closed 2 or 3 times for the merest fraction of a second. Under mild pressure electrode penetrates deeper each time current flows.
6. Electrode withdrawn and re-applied further along same line, at discretion.
7. Treatment continued a week or ten days later, when area is clear of slough.
8. In the meantime treatment may be started on the other tonsil. (Anesthesia unnecessary).

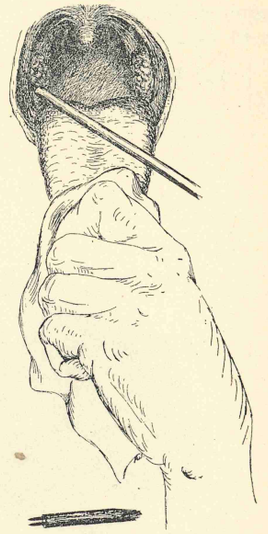


Fig. 63

(b) Electrodissection of Upper Pole and Postero-Internal Surface

Technique:

1, 2 and 3 same as in (a).

4. Curved bipolar electrode applied between tonsil and posterior pillar at upper pole or at internal margin, as required. Same caution as in (a).

5, 6, 7 and 8 same as in (a).

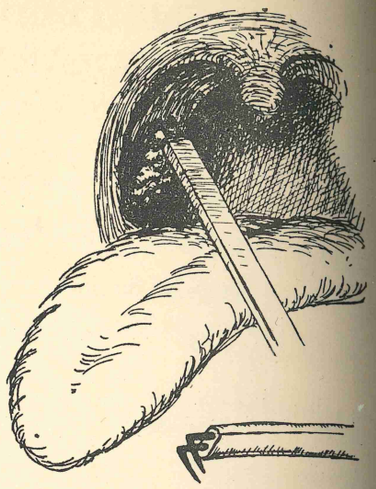


Fig. 64

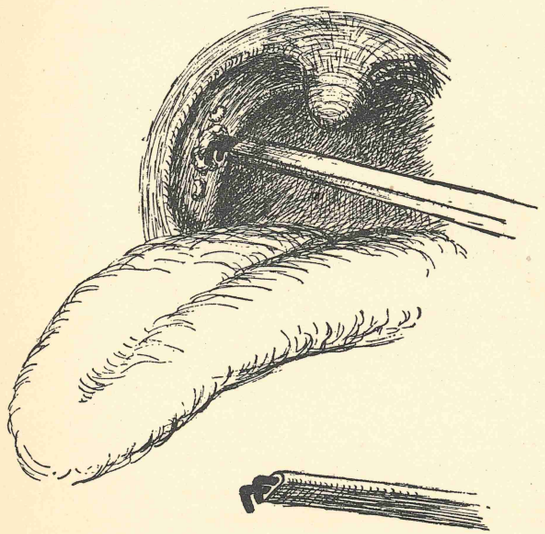


Fig. 65

(c) Electrocoagulation of Stump and Linguals

Technique:

1, 2 and 3 same as in (a).

4. Bipolar surface electrode applied against stump.

5. Foot switch closed one or more times for the merest fraction of a second.

6, 7 and 8 same as in (a).

ELECTROPUNCTURE OF PERITONSILLAR ABSCESS

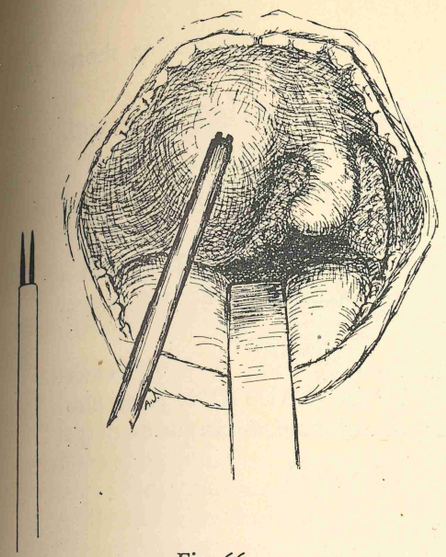


Fig. 66

Technique:

1. High frequency machine set eo deliver 1250 m.a. on short circuit.
2. Tongue depressed.
3. Straight bipolar electrode applied somewhere in a line drawn from last molar to base of uvula—preferably at spot where abcess is beginning to point.
4. Foot switch closed repeatedly for the merest fraction of a second under mild pressure. Electrode will advance under each closure of switch until absess cavity is penetrated.
5. Electrode rotated 1/4 turn and withdrawn while current is on.
6. Abscess may be allowed to drain spontaneously, or contents may be aspirated. (Preliminary application of cocain optional).

SUBCOAGULATION OF HYPERTROPHIED TURBINATES

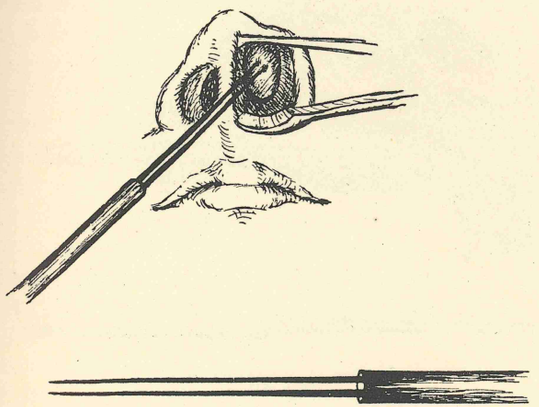


Fig. 67

Technique:

1. High frequency machine set to deliver 1250 m.a. on short-circuit.
2. Anterior surface of turbinate anesthetized topically with alypin, butyn or some other non-shrinking anesthetic.
3. Long, straight bipolar electrode applied axially at midpoint of fleshy mass.
4. Foot switch closed 2 or 3 times for the merest fraction of a second, under mild pressure. Electrode penetrates deeper each time current flows.
5. After electrode has penetrated 1/8 inch, it is introduced without current as far as it will go. CAUTION: Keep electrode needles in fleshy part of turbinate, not in the cartilage.
6. Foot switch closed for about 1 second.
7. Electrode withdrawn.
8. After shrinkage has taken place (1 to 2 weeks), repeat treatment if necessary.

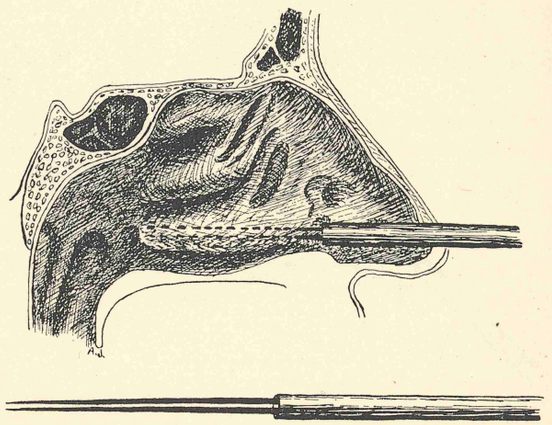


Fig. 68

APPLICATION OF DIATHERMY OR GALVANISM TO THE NASAL CAVITY

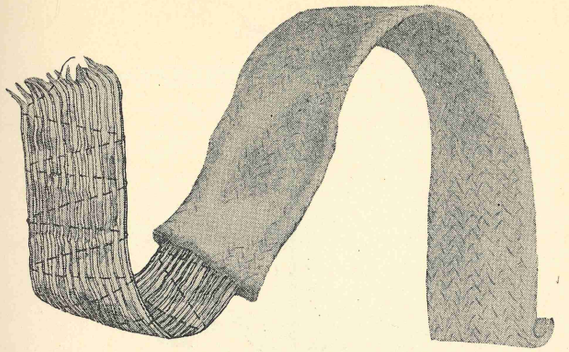


Fig. 69, magnified. Real width, 1/4 of an inch.

Technique: 1. A suitable length of metallic talking-tape is threaded through a corresponding length of cotton, silk or rayon sleeving, to serve as intranasal electrode. This is saturated with the desired solution of salt, copper or zinc and packed into the nares with speculum and forceps.

2. Dispersive electrode consists of a square of mesh or tinfoil applied to the brow, vertex or occiput depending as required, contact through the hair being secured by means of water soluble surgical lubricant in which a little salt has been incorporated.

Further steps depend on condition to be treated, as follows:

A. Hypervascularity of Nasal Mucosa

Connect metallic tape with positive and dispersive plate with negative pole of galvanic generator, having previously saturated nasal electrode with 1% copper solution. Gradually increase current flow to from 10 to 25 M. A. to tolerance, continuing treatment for 10 minutes. Repeat every other day until result is satisfactory.

B. Atrophic Rhinitis

Connect tape and plate with poles of slow galvanic sinusoidal generator using normal saline solution. Gradually increase current to tolerance, continuing for 15 minutes. Repeat every other day.

C. Chronic Ethmoiditis with Adequate Aeration and Drainage.

Apply dispersive plate to vertex and connect plate and tape to terminals of diathermy generator, using normal saline solution on nasal electrode. Gradually increase diathermy current to 750 M. A. more or less, according to tolerance. Continue treatment for 20 minutes. Repeat every other day.

METALLIC IONTOPHORESIS OF MIDDLE EAR

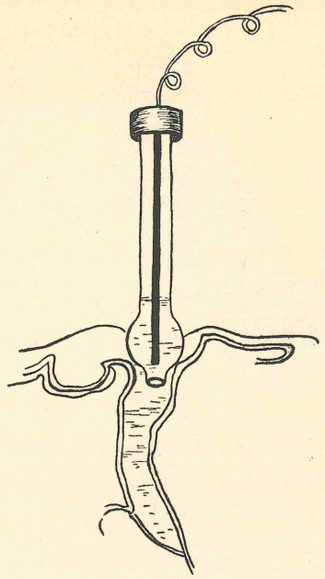


Fig. 70

Indication:

Chronic discharging ear with large perforation of membrana tympani and absence of marked involvement of mastoid cells.

Technique:

1. External canal thoroughly cleansed.
2. Patient lying on side, with affected ear upward.
3. Large negative electrode applied somewhere on same side of body as affected ear.
4. External auditory canal filled with 1% zinc sulphate or copper sulphate solution.
5. Glass cannula containing positive electrode introduced into canal.
6. Galvanic current turned on very slowly, to patient's tolerance (usually about 4 or 5 m.a.), and continued for 10 minutes; later 15.
7. Treatment repeated 2 or 3 times a week.

Electrotherapeutic Procedures In Gynecology

by

EDWARD A. HOROWITZ, M.D.

SHORT WAVES

The application of short waves in gynecology is governed by the same principles as those set forth in the chapter on short waves (pages 10-16). The relative effectiveness of various methods of application of short waves, in heating the female pelvic organs, is still under investigation. However, it can be stated that an internal electrode is required for the production of high local temperatures. The use of condenser electrodes applied to the abdomen and lower back, although placing the pelvis in the electric field, does not produce marked temperature elevations internally. The internal electrodes used are of two types, the condenser electrodes, and the bare metal electrodes. With the internal condenser electrode, a large condenser plate may be placed as the indifferent electrode over the lower abdomen, or a unipolar technic may be used. Some workers use the anterior and posterior condenser plate technic but in addition place in the vagina a bare metal electrode in no way connected to the short wave generator. The internal electrode is said to concentrate the electrical energy and increase the pelvic heating.

The precise indications for pelvic short wave therapy and its relative value as compared with pelvic diathermy, have not as yet been definitely established.

PELVIC DIATHERMY USING A VAGINAL ELECTRODE

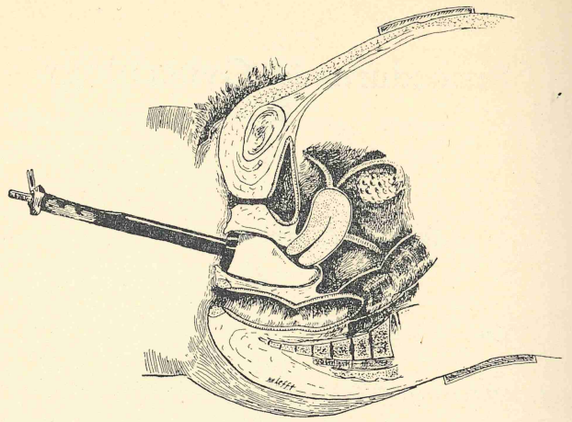


Fig. 71

Indications: Chronic adnexitis; chronic parametritis or perimetritis; chronic pelvic exudates; chronic cystitis; adhesions following pelvic inflammation (adherent retroversion of the uterus).

Contraindications: Pregnancy; neoplasms of uterus or ovaries; the acute stages of pelvic inflammation; pelvic abscesses; menstruation (discontinue treatment three days before expected time of periods and wait until three days after end of period before starting again); abnormal uterine bleeding, unless slight and apparently the result of chronic adnexitis; cases in which diagnosis is uncertain (possibility of ectopic pregnancy?); cases in which pelvic diathermy treatment causes an increase in pelvic pain or an elevation of temperature.

Electrodes: Vaginal electrodes are cylindrical, eggshaped or spade-shaped. The vaginal electrodes devised by Cherry, Chapman, Derow and Horowitz are equipped with thermometers. If electrodes of several sizes are available, use the largest which can be inserted without discomfort.

As the dispersive (or indifferent) electrode, a belt of flexible electrode metal, 3½ inches wide, is applied about the waist of the patient, its lower edge just above the level of the iliac crests.

Position: dorsal, with the knees drawn up and separated, draped as for any gynecological treatment. The lesser labia having been separated, the vaginal electrode, warmed to body temperature and lubricated (not with vaseline), is inserted with its long diameter in a vertical position. At the introitus, pressure is made posteriorly against the perineal tissues, and not against the sensitive urethral area. Having passed the introitus, the electrode is rotated so that its longer diameter becomes transverse with the concavity anterior. It is advanced further into the vagina, passing beneath the cervix, until its extremity has come into contact with the posterior vaginal fornix. The electrode being now in place the patient may extend her lower extremities into any comfortable position.

Start the first treatment with 1000 milliamperes. At the end of 10 minutes, if the patient is comfortable, increase the current to 1300 milliamperes. If there is no increase of pelvic pain and no temperature elevation following the first treatment, stronger currents may be used on subsequent occasions.

In treating pelvic infections of gonococcal origin, a high degree of pelvic heating is desirable. The treatment in such cases is started with 1200 or 1500 milliamperes. At the end of 10 minutes, increase the current by 500 milliamperes. The electrode thermometer will now register a temperature between 107 and 110 degrees F. Because individuals vary in electrical resistance, due to anatomical differences, the same milliamperage may heat different individuals unequally. If the patient is comfortable, the vaginal temperature may be maintained at 107 to 108 degrees F., further increasing the milliamperage at five minute intervals, if necessary, to maintain this temperature. A current strength of between 2200 milliamperes and 2800 milliamperes is usually attained by the end of the treatment.

Pelvic diathermy treatments are usually administered three times a week, except during menstruation and the three days before and after each period. The first treatment administered to a patient is brief, lasting but 20 minutes. Subsequent treatments are of 30 to 60 minutes' duration.

Supplementary care is necessary, including rest (especially during menstruation), proper diet, bowel hygiene and abstinence from alcohol and coitus. In gonococcal cases, clearing up of cervical and urethral infection and avoidance of reinfection, are necessary.

PELVIC DIATHERMY USING RECTAL ELECTRODE

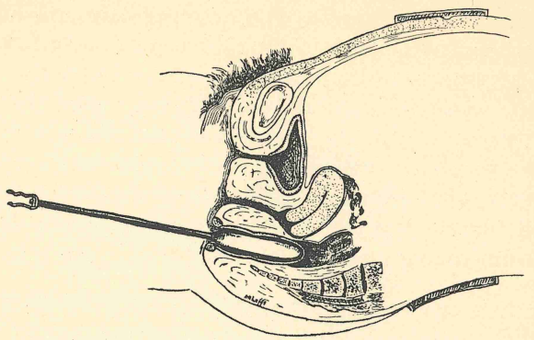


Fig. 72

Indications: The same as for "Pelvic diathermy using vaginal electrode", but the rectal electrode is more useful than the vaginal in the following types of cases: 1. Exudates or adnexal masses in the cul-de-sac of Douglas; 2. Posterior parametritis; 3. Adherent retroversion.

Contraindications: In addition to those listed under "Pelvic diathermy using vaginal electrode," any painful ano-rectal condition.

Electrodes: Most useful for adults is an electrode of cylindrical form with rounded end, 3½ or 4 inches long, ½ to 1 inch in diameter. Some rectal electrodes are hollow, equipped with thermometers. If a solid rectal electrode is used, a thermometer may be placed in the vagina to register the local temperatures developed during treatment.

As the dispersive electrode, use a large plate of electrode metal on the abdomen, held in place by a sandbag, or the 3½ inch belt of flexible metal about the patient's waist.

Proper bowel evacution before treatment is essential (by enema, if necessary). The rectal electrode, warmed to body temper-

ature and lubricated (not with vaseline) is introduced with the patient lying upon her side. The electrode should be introduced completely into the rectum, so that only the slender insulated stem of the instrument lies within the anal canal. Insertion of the rectal electrode may be guided by a finger in the vagina.

Start each treatment with 1000 milliamperes. After the first treatment the current is increased to reach a maximum of between 1500 milliamperes and 2200 milliamperes. If the sensation of heat in the rectum changes to an ache, it is necessary to reduce the current until only heat is felt again. Temperatures between 104 and 108 degrees F. will be registered by the thermometer in the vagina during treatment.

Frequency, duration of treatments and supplementary care, see page 79.

URETHRAL DIATHERMY (CUMBERBATCH TECHNIQUE)

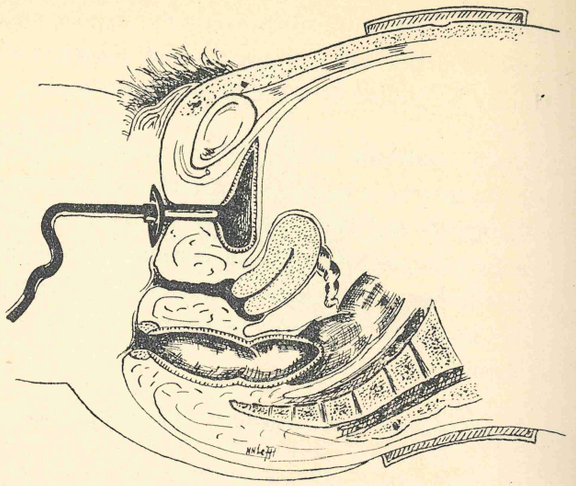


Fig. 73

Indication: Gonorrheal urethritis.

Contraindications: Acute pelvic inflammation; menstruation.

Electrodes :The Cumberbatch urethral electrode is used.

The dispersive electrode (see page 78). The lower margin of this belt extends almost to the pubic symphysis.

The bladder is emptied just before treatment. Position—dorsal, with knees drawn up and separated, the patient being draped as for any gynecological treatment. The lesser labia having been separated, the urethral area is sponged clean. The urethral electrode is then inserted so that the ebonite disc comes in contact with the external meatus. The outer end of the electrode is supported by a stand which also connects it to the diathermy machine.

The diathermy current is gradually increased until the sensation of heat in the urethra becomes painful. It is then slightly decreased until pain disappears. The milliampereage now is somewhere between 500 and 800 (averaging 600 milliamperes). This

current is allowed to flow for ten minutes. The patient's sensations must always be respected to avoid the danger of overheating with resultant coagulation of the urethral tissues.

Treatments are administered two or three times a week, except just before and during menstruation. Treatment is discontinued when five consecutive smears have been negative for gonococci.

CERVICAL DIATHERMY (CUMBERBATCH TECHNIQUE)

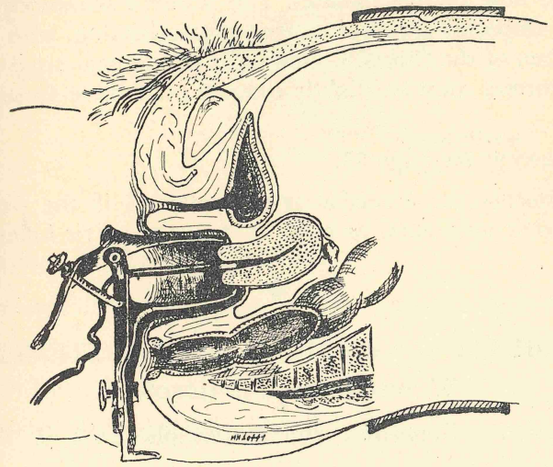


Fig. 74

Indications: Gonorrheal cervicitis.

Contraindications: Acute pelvic inflammation, pregnancy; menstruation (or impending menstruation); abnormal uterine bleeding.

If patient has had a recent attack of pelvic inflammation, general pelvic diathermy with vaginal or rectal electrode is administered two or three times a week for two weeks before the local treatment of the cervix is commenced.

Electrodes: The Cumberbatch cervical electrode is used.

The dispersive electrode (see page 78).

Position—dorsal, with knees drawn up and separated, patient being draped as for any gynecological treatment. A bivalve specu-

lum is inserted exposing the cervix, which is wiped free of secretion. The cervical electrode is introduced ¾ of an inch into the cervix. The outer end of the electrode is supported by a stand which also connects it with the diathermy machine.

The patient having just received a urethral diathermy treatment, the amount of current tolerated by the urethra has been ascertained. Half of this milliampereage is used in treating the cervix, (between 250 and 400 milliamperes). This current is permitted to flow for ten minutes. The patient's sensations must always be respected to avoid danger of overheating, with resultant coagulation of the tissues. If cramps or aching pain are complained of, the current must be slightly reduced until these sensations disappear.

Frequency: see page 83.

Treatments are immediately discontinued if the patient develops pelvic tenderness or other evidence of pelvic inflammation.

●

PELVIC HEATING COMBINED WITH SYSTEMIC FEVER

W. BIERMAN and E. HOROWITZ

Indications: Gonorrhea and its complications in the adult female.

The patient's temperature is elevated to 105-106° F. by any desired physical method. The patient is then covered up to the neck with a box containing carbon filament lamps. Four large dispersive electrodes, connected together, are applied to the back, the abdomen and each thigh and connected with one pole of the diathermy machine. A special diathermy electrode is introduced into the vagina and connected with the other pole.

Current intensity: 1800 to 3000 M.A. for 4 hours, guided by the thermometer in the vaginal electrode.

The local temperature is thus maintained at 110° to 111° F. To prolong the heating, a large rectal electrode may be introduced into the rectum and the current continued for 1 to 1½ hours or one can circulate cool water through the vaginal electrode. The systemic fever of 105 to 106° F. is maintained throughout treatment.

URETHRAL DIATHERMY USING CORBUS THERMOPHORE

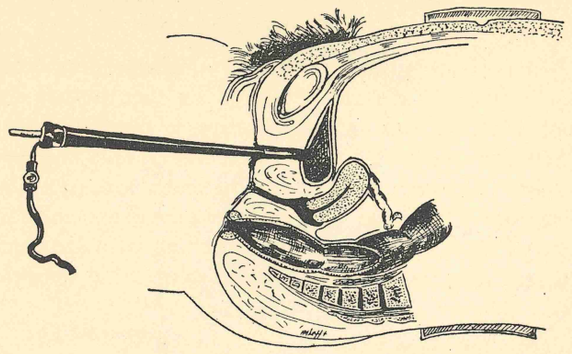


Fig. 75

Indication: Gonorrheal urethritis.

Contraindications: Acute pelvic inflammation; menstruation.

Electrodes: The Corbus Thermophore is used (equipped with thermometer).

Dispersive electrode, see page 78.

Preparation of patient: see page 82.

The current is turned on gradually, watching carefully the reading of the electrode thermometer. When this has reached 105 degrees F. wait for five minutes, then increase the milliampereage until the temperature reaches 109 degrees F. Five minutes later the milliampereage is increased so that the electrode thermometer registers 112 to 113 degrees F., depending upon the tolerance of the patient. Between 600 and 900 milliamperes will be required. This temperature is maintained for one-half hour. The patient's sensations must always be respected and the current reduced if necessary, to avoid the danger of overheating with resultant coagulation of the urethral tissues.

Treatments are administered once or twice a week, except just before and during menstruation.

CERVICAL DIATHERMY USING CORBUS THERMOPHORE

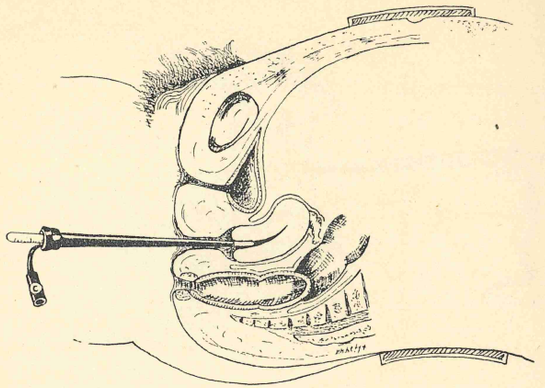


Fig. 76

Indication: Gonorrheal cervicitis.

Contraindications: Acute pelvic inflammation (see page 83); pregnancy; menstruation (or impending menstruation); abnormal uterine bleeding.

Electrodes: The Corbus thermophore is used.

Dispersive electrode, see page 78.

Preparation of patient: see page 82.

The current is gradually increased until 114 to 116 degrees F. are registered by the thermometer in the electrode. If cramps or aching pain are complained of, the current must be reduced until these sensations disappear. When the temperature maximum has been reached, it is maintained for 40 minutes.

Frequency: see page 85.

Treatments are immediately discontinued if the patient develops pelvic tenderness or other evidence of pelvic inflammation.

COPPER IONIZATION OF THE CERVIX

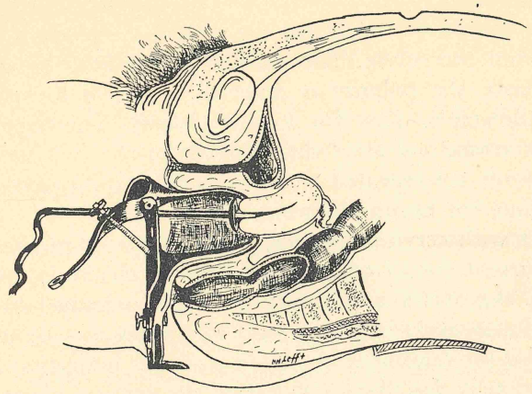


Fig. 77

Indications: Chronic cervicitis; cervical erosion.

Contraindications: Pregnancy; acute pelvic inflammation; menstruation (or impending menstruation); abnormal uterine bleeding.

Electrodes: The cervical electrode is a rod of pure copper 1⅜ inches in length, attached to an insulated stem connected to the positive pole of the galvanic apparatus. The copper rods are made in various thicknesses, straight or curved, of uniform or variable diameter. The Derow cervical electrode shown in the sketch has at its proximal end a flange with a slight concavity, intended for contact with the outer surface of the cervix. Use the largest size which can be easily inserted.

Dispersive electrode; any padded electrode, 4 inches by 6 inches, soaked with 2% salt solution, connected with the negative terminal of the galvanic apparatus. The use of a bare metal indifferent electrode would cause injury to the underlying skin.

Position: see page 83.

The galvanic current is turned up very gradually because any sudden change in its strength will give the patient a slight shock. With the flanged cervical electrode, which has a larger area of tissue contact than the other types, a current of 15 to 18 milli-

amperes is allowed to flow for 15 minutes. With other electrodes (such as the Tovey), a current of 10 to 12 milliamperes is used for 15 to 20 minutes.

At the end of the treatment the copper electrode is firmly attached within the cervix. The current having been slowly turned down to zero, the polarity is reversed, and five to seven milliamperes allowed to flow for a few minutes. This results in increased secretion, and frees the electrode.

Treatments are repeated at intervals of 5 to 10 days, allowing sufficient time for healing between treatments.

In cases with cervical stenosis, preliminary use of the negative galvanic current connected with the cervical electrode results in a dilation of the cervix and a profuse thin discharge, establishing drainage. Successively larger cervical electrodes may be used. Subsequently for the treatment of cervicitis copper ionization is carried out as previously described, connecting the cervical electrode with the positive pole.

ELECTROCOAGULATION OF SKENE'S DUCTS

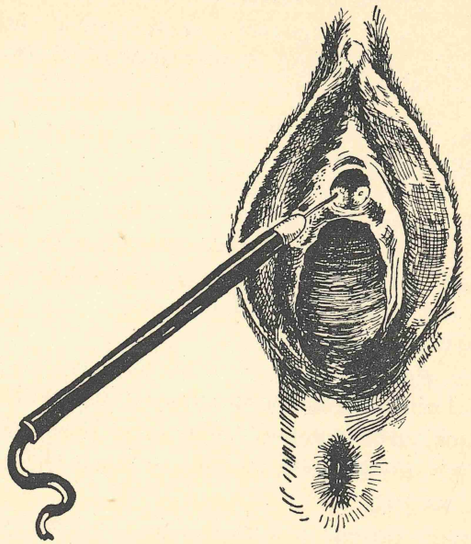


Fig. 78

Indications: Chronically infected dilated Skene's ducts, resistent to other treatment, especially if 1. A nidus of persistent

gonorrheal infection; 2. The origin of a persistent leucorrheal discharge.

Contraindication: Acute stage of gonorrhea.

Electrodes: The active electrode used is a steel needle or fine wire, fastened to a long insulated handle which has a metal core to conduct the current.

The dispersive electrode applied anywhere on body surface.

The diathermy machine is adjusted so that short-circuiting between the coagulating needle and the indifferent electrode demonstrates a current flow of between 250 and 500 milliamperes.

Preliminary anesthesia is necessary. The injection of novocaine solution about the urethral meatus gives immediate anesthesia. If a 10% cocaine or 2% nupercaine solution is applied locally, wait 10 minutes for adequate anesthesia.

Position: Dorsal, with knees flexed and separated. The urethral meatus is exposed and its inferior margin slightly everted by retraction with the index finger and thumb of the left hand. On either side, within the meatus, is the orifice of Skene's duct. By massaging the urethra from within outward with a finger in the vagina, the orifice of the infected duct is identified by the efflux of pus from it. The needle electrode is introduced into the orifice along the duct to its extremity.

Step on the foot switch, inspecting closely the area about the needle. Almost immediately a white foam bubbles up about the needle. Then a whitening of the tissues about the orifice is seen. Release the foot switch and withdraw the electrode. The other Skene's duct is now similarly dealt with.

After care—hot sitz baths, and occasional application of mercurochrome.

ELECTROCOAGULATION OF THE CERVIX USING BALL ELECTRODE

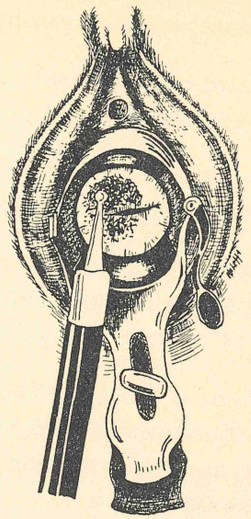


Fig. 79

Indications: Chronic cervicitis; cervical erosion; lacerated everted cervix; Nabothian cysts of the cervix.

Contraindications: Acute pelvic inflammation; menstruation (or impending menstruation); acute gonorrheal infection; pregnancy (although erosions have been coagulated in the pregnant without harm in some cases).

Electrodes: The active electrode used is a small metal ball about the size of the small end of a collar button. The ball is attached to long insulated handle.

For dispersive electrode see page 89.

The diathermy machine is adjusted so that short-circuiting between the coagulating ball and the indifferent electrode demonstrates a current between 2000 and 3000 milliamperes.

Erosions may be coagulated without anesthesia, but preliminary anesthesia is desirable for coagulating within the cervical canal. A satisfactory anesthesia may be attained by a 10 minute application of 20% cocaine or of 2% nupercaine, within the cervical canal.

Position: See page 83.

The ball electrode is placed in contact with the area on the cervix which is to be coagulated, and the foot switch stepped upon. As coagulation occurs, evidenced by a blanching of the tissue, the ball electrode is passed slowly to other surfaces requiring treatment.

The beginner working with the lower milliampereage specified can be deliberate in his movements, being guided by the visible effect produced. With the stronger currents a more rapid coagulation occurs. The ball electrode is not removed from contact with the tissues while the foot is on the switch because undesirable sparking would result. Care is also taken that the ball electrode or its metal stem does not touch the metal vaginal speculum.

In coagulating a superficial Nabothian cyst, the ball electrode is held against it and the foot switch closed until after a few seconds a "pop" is heard as the cysts contents escape. Deeper cysts may be entered and coagulated with the needle electrode previously described.

To coagulate the cervical canal, introduce the ball electrode to the desired depth, then close the foot switch and slowly withdraw the ball electrode to the external os, meanwhile pressing it against the interior of the canal.

After care: Do not disturb the coagulum which will separate spontaneously about the 12 to 14th day. Douching is permitted for the temporarily increased discharge. Coitus is forbidden until epithelialization has occurred, usually five weeks after the coagulation treatment.

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SHORT WAVE THERAPY and GENERAL ELECTRO-THERAPY

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and
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